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INDEX TO VOL. LXVII

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	Page		Page		Page
A		Alipuram Jail, Bellary, An Epidemic Jaundice in, from January to July, 1931 (Ince) (O. A.)	13	Annual Reports.	
Abbasi, M. M. A. A Case of Acute Dilatation of the Stomach	521	Bellary (South India). An Epidemic of Jaundice in the (Pandit and Rao) (O. A.)	77	Annual Report of the Executive Health Officer Bombay for the year 1930	174
Abrahams, A. <i>Disorders of the Digestive Organs</i>	592	All-India Conference of Medical Research Workers, The Ninth (M. N.)	103	Annual Report of the Health Officer for the City of Rangoon for the year 1929	175
Abscess, Brodie's, A case of (Rahman and Mangalik) (O. A.)	627	Medical Council Bill (M. N.)	32	Public Health Report of the Province of Bihar and Orissa for the year 1930	176
Acharya, A. K. see De, J. C., Laha, K., and Ghose, K. K. The Significance of the Widal Reaction and other Laboratory Findings in Typhoid Fever	366	Medical Licentiates' Conference (M. N.)	103	Report of Director of Public Health of the Central Provinces and Berar for the year 1930	176
Acidosis from the Clinician's Point of View (C. T.)	38	Ophthalmological Society—Published by the—Proceedings of the All-India Ophthalmological Society, Vol. II, Session 1931	591	Annual Report on the Health Department of the Municipality of Singapore for the year 1930	231
Acriflavine as a counter-stain in the Ziehl-Neelsen Method of Staining (Ince) (O. A.)	262	Allergic Dangers, Therapeutic Serums and (C. T.)	40	Report of the Director of Public Health of United Provinces of Agra and Oudh for 1930	232
Acton, H. W. The Classification and Grading of Different Qualities of Indian Rices in connection with the Epidemic Dropsy Problem	640	Aloin in Pregnancy (Sircir) (C.)	234	Public Health Report of the Provinces of Assam for the year 1930	232
H. W., Fasricha, C. L., Roy, A. C. and Das Gupta, S. M. A New Vegetable Culture Medium made from the Papain Digest of Mung Dal (<i>Phaseolus mungo</i>), green variety	619	Amelias Problem, The (C. T.)	470	Annual Report, Civil Hospitals and Dispensaries, Madras Presidency, for the year 1930	291
Addison, W. H. F. Edited by—Brain and Spinal Cord (Emil Billiger)	227	Anæmia of Pregnancy (Gupta) (O. A.)	421	Annual Report of the Government General Hospital, Madras, for the year 1930	349
Adya, P. K. Renal Colic in Infants	388	of Pregnancy (Gupta) (C.)	658	Annual Report of the Union Mission Tuberculosis Sanatorium, Arogyavaram, Madanapalle, S. India, 1930-31	409
Ahmed Bakhsh. Notes on a Case of Suppurating Hydatid Cyst of the Abdominal Wall	519	of Pregnancy, The Tropical (E.)	459	Annual Report of the Central Co-operative Anti-Malaria Society, Ltd., of 1932	536
Notes on Two Unusual Cases of Stones in the Bladder	522	Anæmias, Massive Iron Dosage for Chronic Secondary (Jayawardene) (C.)	417	Annual Report of the Public Health Commissioner with the Government of India for 1929. Vol. I (with Appendices)	536
Air Passages, An Unusual Case of Foreign Body in the (Lal) (H. P.)	522	Anæsthesia, Avertin (Variava) (O. A.)	548	Annual Report of the Public Health Commissioner with the Government of India for the year 1930, Vol. II	655
Aldehyde Reaction in Kala-azar, The Prognostic value of the (Chopra and Chaudhury) (O. A.)	260	General (C. T.)	471	Federated Malay States Annual Report of the Institute for Medical Research for the year 1930	55
Alepol in Leprosy (Dikshit) (O. A.)	7	Percain in Spinal (Dikshit and Rao) (O. A.)	69	Fifty-sixth Annual Report of the Chemical Examiner's Department, Bengal, for the year 1930	657
in the Treatment of Leprosy (Bhandari) (O. A.)	244	Spinal (Robinson and Seshachalam) (S. A.)	148		
		Ankles, Sprained, Treatment of (C. T.)	281		
		Annual List of Registered Medical Practitioners, Published by the Burma Medical Council, 1932	534		
		Medical List, 1932. Published by the Bengal Council of Medical Registration	534		

	Page		Page		Page
Annual Reports—concl'd.		Anti-malarial Measures in Travancore (Clemesha) (C.)	137	Bailey, H. Emergency Surgery and Love, R. J. M. A Short Practice of Surgery	288
Hong Kong Medical and Sanitary Report for the year 1930	118	—Measures in Travancore (Watson) (C.)	35	Baillière, Tindall and Cox, published by, <i>Annals of the Pickett-Thomson Research Laboratory</i> , Vol. I (in two parts). Vol. II, Part I	712
Kashmir C. M. S. Hospital. Report for 1931	475	Antimony, The Pentavalent Compounds of, in the Treatment of Kala-azar (C. T.)	03	—Tindall and Cox, published by, <i>Annals of the Pickett-Thomson Research Laboratory</i> , Vol. VII	229
King Edward VII Memorial Pasteur Institute, Shillong. Fourteenth Annual Report for the year 1930	53	Anti-Rachitic value of Sun-Irradiated Yeast, A Preliminary Note on the (Wilson) (O. A.)	20	—Tindall and Cox, A Catalogue of the Publications of, in Medicine and Science, 1932	113
London School of Hygiene and Tropical Medicine, Annual Report for the year 1930-31	593	Antisera by the Mouth (Basu) (C.)	78	Baillière's <i>Synthetic Anatomy</i> . Complete in Parts I—XII	715
Malaria Investigations in some parts of the Transvaal and Zululand	117	Appendicitis, Chronic (C. T.)	14	Balfour, M. I. A Manual of Mothercraft	408
Municipality of Singapur, Health Department, Annual Report for 1931	656	—in Old Age, A Clinical Study of Acute (C. T.)	4	—and Talpade, S. K. The Influence of diet on Pregnancy and early infant mortality in India	291
Nineteenth Annual Report of the Superintending Engineer, Public Health Department (Engineering Branch), Bihar and Orissa, for 1930-31	233	—Recurrent with a large fecal concretion (Ujwal)	5	Ball, W. G. and Evans, G. <i>Dis-eases of the Kidney</i>	601
Report of the European Mental Hospital at Ranchi for the Triennium, 1927-29	51	Araujo, E. L. F. <i>Do Mycetoma Pedis No Brasil</i>	3	Bandicoot-bite Fever, A case of (Fillai) (H. P.)	589
Reports of the Rotunda Hospital for the year 1929-30	54	Artemesia, Indian Species of (Hirst) (C.)	9	Banerji, K. M. see Sur, S. N., and Sarkar, H. P. Plasmochin as a Malarial Gametocide	628
Report of the Chemical Examiner to the Government of the Punjab for 1931	652	Aschheim-Zondek Tests for Pregnancy, The Results of one thousand (C. T.)	54	Bangalore, India, Three cases of 'Tropical Typhus' occurring in (C. T.)	490
Report on the Public Health Administration of Burma for the year 1930	118	Asphyxia Pallida (Dey) (H. P.) (Perera) (H. P.)	6	Banker, S. S. A Plea for the Use of Suction	706
Report of the European Conference on Rural Hygiene, 1931	233	Aspiration, A Note on Treatment of Liver Abscess by (Bhandari) (O. A.)	6	Barker, L. F., and Tréscher, J. H. <i>Backache</i>	18
Report of the Director of Public Health, Madras, for the year 1930	408	Assam Jail, An Outbreak of Exfoliative Glossitis in an (Pitzgerald) (O. A.)	51	Barkeley, C. A Handbook of Midwifery	714
Report of the Medical Research Council for the year 1930-31	410	Ataxia, Locomotor, A case of, in an Indian (Hameed) (H. P.)	57	Barker, L. F., and Tréscher, J. H. <i>Backache</i>	228
Report of the Haffkine Institute for the year 1930	476	Atebrin, The behaviour of Plasmodia in the Mosquito after Treatment of the Human Host with (Strickland and Roy) (O. A.)	19	Basu, K. M. Antisera by the Mouth	179
Report of the Medical Officer of Health, Delhi Municipality for the year 1930	174	—A case of Blackwater Fever treated by (Das Gupta) (H. P.)	331	—U. P. The Prevention of Heart Affections in India	566
—on the Public Health Administration of the Punjab for the year 1929	175	—in Malaria (Strickland and Roy) (C.)	597	'Bayer 205', Three cases of Plague Treated with (Rao) (H. P.)	626
Report of the Medical Officer of Health of Colombo for 1930	176	—in Malaria (Urchs) (C.)	597	Belilios, A. D. <i>An Outline of the Human Body</i>	116
Report on the Session of the Office International D'Hygiene Publique held in Paris, October 1931	233	—and Plasmochin, Field Experiments with (Napier, Butcher and Das Gupta) (O. A.)	186	Bellingham-Smith, E. and other. <i>Modern Medical Treatment</i>	44
Report on the Health of the Army for the year 1930	292	—A Synthetic Drug for the Treatment of Malaria (Napier and Das Gupta) (O. A.)	181	Bendien, S. G. T. <i>Specific Changes in the Blood Serum: A Contribution to the Serological Diagnosis of Cancer and Tuberculosis</i>	531
Seventh Annual Report of the Pasteur Institute, Calcutta, for the year 1930	537	Atkinson, F. R. B. <i>Acromegaly</i>	715	Bengal Secretariat Book Depot—Published by—Presidency General Hospital Pharmacopæia and Diet Scales, 1930	173
Sixth Annual Report of the Pasteur Institute, Calcutta, for the year 1929	117	Atropine in the Reduction of Hernia, The mode of action of (Rodrigues) (C.)	234	Bennett, T. I. <i>The Practical Treatment of Diabetes</i>	46
Sixty-ninth Annual Report of the Government Cinchona Plantations and Factory in Bengal, for the year 1930-31	293	Avertin Anaesthesia, A Study of 114 cases (Variava) (O. A.)	548	Berberine and Berberine-containing Plants in Pharmacology and Therapeutics (Chopra, Dikshit and Chowhan) (O. A.)	194
The Mission to Lepers. Report on the Fifty-seventh Year's Work in India, 1930-31	295	—in the Presence of Damaged Liver Function, The use of (C. T.)	587	Berkeley (C.). Under the direction of—Midwifery—By ten teachers	225
The Pasteur Institute of Southern India, Coonoor. Annual Report of the Director for the year 1930	535	B		Berkeley-Hill, O. A. R. The Place of Psychiatry in the Medical Colleges and Schools in India	578
The Rockefeller Foundation. Annual Report for 1930	230	Bacillary Dysentery, The Treatment of, by Bacteriophage (McKay) (O. A.)	666	—O. A. R. Psychological Aspects of Opium Addiction	119
The South African Institute for Medical Research, Annual Report for 1930	538	<i>Bacillus alkaligenes</i> , A case of severe Enteric-like Fever due to (Srinivasan) (H. P.)	569	Berlin, International Medical Post-Graduate Courses in (M. N.)	641
Antagonism in Diseases (Thakkar) (C.)	177	—coli in the Calcutta Filtered Water Supply, A Preliminary Report on (Das Gupta) (O. A.)	380	Bertolotti, M. <i>Alessandra Magno</i>	715
Anthelmintic, Hexylresorcinol as an (Maplestone and Mukherji) (O. A.)	610	Bacteriophage, The Nomenclature of (E.)	515	Bertwistle, A. P. <i>A Descriptive Atlas of Radiographs</i>	289
Anthelmintics, The Testing of (O. A.)	673	—The Treatment of Bacillary Dysentery by (McKay) (O. A.)	666	Bhandari, A. D. Alepol in the Treatment of Leprosy	244
Anthrax Pustule of the Neck (Husain) (H. P.)	517	Baer Maggot Treatment of Osteomyelitis (C. T.)	401	—S. L. A Note on Treatment of Liver Abscess by Aspiration	682
Anthrax, The Treatment of, by N. A. B. (C. T.)	220			Bhate, D. B. A case of Cerebral Malaria	628

Page		Page		Page
Bhatia, B. B.	A Case of Stone in the Bladder presenting a Peculiar Symptom-complex .. 84	Bose, A. N. and Ghosh Dastidar, S. K.	The Protective Value of T. A. B. Inoculation as indicated by the Agglutinating Power of the Serum .. 504	Calcium content of the common dietaries in India (Sahu) (O. A.) .. 140
—	— see Vyas, B. N. On the Failure of <i>Todalia aculeata</i> in the Treatment of Malaria .. 192	—	A. N. see Sahu, D. R. N. The Calcium Content of the Common Dietaries in India .. 140	— in Skin Diseases, The Use of (C. T.) .. 586
Bhattacharjee, J.	Quacks versus Qualified .. 417	—	C. Pillage Sanitation and a Manual of Hygiene (written in Bengali) .. 408	Calculi, Notes on Urinary (Sabawala) (O. A.) .. 509
—	S. P. The Reticulo-Endothelial System and some diseases in the Tropics .. 271	—	J. P. A Study of the Distribution of Sugar in the Blood of Diabetic and Non-Diabetic Indian Subjects .. 541	Calcutta Filtered Water Supply, A Preliminary Report on <i>Bacillus coli</i> in the (Das Gupta) (O. A.) .. 380
Bhattacharyya, A. K.	Two Interesting Cases of Malaria .. 571	—	J. P. see Chopra, R. N. A Case of Congenital Single Kidney with Dilated Ureter .. 679	Calcutta, Malaria in (E.) .. 511
Bigger, J. W.	Handbook of Bacteriology .. 535	—	K. C. Pharmacoparia Indica .. 652	Calcutta School of Tropical Medicine, and Hygiene, Examination Result held in April, 1932 (M. N.) .. 277
Bilard, G.	Phylaxis .. 171	—	M. Severe Reaction following the Injection of Urea-Stibamine .. 87	— School of Tropical Medicine, (Result of L. T. M. Examination, Session 1932) (M. N.) .. 704
Bilderbeck, C. L.	A Practical Note on the Cyanide Fumigation of Ships .. 200	Bourne, A. W. and Williams, L. H.	Recent Advances in Obstetrics and Gynaecology .. 714	Calthrop, L. C. E. Hydrotherapy and Physiotherapy .. 228
Billiger, E.	Brain and Spinal Cord .. 227	Brahmachari, B. B.	Constants of Pure Buffalo Ghi .. 623	Campbell, H. G. M. see Napier, L. E. Observations on a Plasmodium Infection which causes Hæmoglobinuria in certain species of Monkey .. 246
Biochemical and Allied Research in India in 1931 (M. N.) .. 705		—	The Vitamine Value of the Food Fats of Bengal .. 377	— J. M. Those Teeth of Yours: A Popular Guide to Better Teeth .. 116
Biological Assay of Drugs in India (E.) .. 573		Bray, G. W.	Recent Advances on Allergy .. 111	Camphor, Thymol, Menthol and, from Indian Sources (Chopra and Mukerjee) (O. A.) .. 361
Birdwood, G. T.	Advice to the Expectant Mother: Fifty Antenatal Talks .. 650	Breath, Offensive (C. T.) .. 285		Cancer Cures (C. T.) .. 284
Birkeland, I. W.	Medicine: Analytical Reviews of General Medicine, Neurology and Pediatrics, Vol. XI, February, 1932 .. 529	British Medical Association, The Centenary Meeting (M. N.) .. 214		Candy, R. H. Erosion of the Skull by an Intracranial Tumour .. 265
Birth Control and Public Health, Published by the Society for the Provision of Birth Control Clinics, London .. 407		— Association, Centenary Meeting, The Lighter Side of the (M. N.) .. 701		Cannon, A. Hypnotism, Suggestion and Faith-Healing .. 715
Birthday Honours, 1932 (M. N.) .. 641		Brodie's Abscess, A case of (Rahman and Mangalik) (O. A.) .. 627		— A. and Hayes, E. D. T. The Principles and Practice of Psychiatry .. 651
— Indian Medical, 1932 (M. N.) .. 395		Bronchogenic Carcinoma, Primary (Seal) (O. A.) .. 553		Carbohydrate, Increased, in the Treatment of Diabetes Mellitus (C. T.) .. 526
Bismuth, Is it safe for Intravenous use? (Thakkar) (C.) .. 177		Browning, E.	Monographs of the Pickett-Thomson Research Laboratory, Vol. I .. 114	Carcinoma, The Etiology of (E.) .. 333
Biswas, S. K.	The use of Mustard in Pneumonia .. 296	Bruce, D.	Passing of a Pioneer (E.) .. 157	— Primary Bronchogenic (Seal) (O. A.) .. 553
Blackie, W. K.	A Helminthological Survey of Southern Rhodesia. (Memoir No. 5.) Published by the London School of Hygiene and Tropical Medicine .. 475	Buffalo Ghi, Pure, Constants of (Brahmachari) (O. A.) .. 623		Cardiac Rhythm, Changes in, in a Case of Rheumatic Mitral Disease Complicated with Broncho-Pneumonia (A Correction) (Hughes) (C.) .. 718
Blacklock, D. B. and Southwell, T.	A Guide to Human Parasitology .. 169	Bulletin of Hygiene (M. N.) .. 641		— Rhythm, Changes in, in a case of Rheumatic Mitral Disease complicated with Broncho-Pneumonia (Hughes and Yusuf) (H. P.) .. 568
Blackwater Fever, The Ætiology of (McGuire) (C.) .. 657		Bunce, E. H.	Observations on the Composition of Butter Imported into Burma .. 326	Casualties in War (E.) .. 91
— A case of, precipitated by P to m a i n e Poisoning due to unclean D e g c h i e s (Reynolds) (H. P.) .. 198		Burke, G. T.	A case of Malaria with Cerebellar Localization .. 197	Cataract in the Punjab, Notes on (Jamal-ud-din) (O. A.) .. 386
— treated by Atebrin, A Case of (Das Gupta) (H. P.) .. 330		Burma, Dysentery in (Military Stations) with a Note on Some Post-Dysenteric Infections (Wats and Jafar) (O. A.) .. 446		Cataract, Senile, The Modern Intracapsular operation for (Gnanadickam) (O. A.) .. 559
Bladder, A case of stone in the, presenting a peculiar symptom-complex (Bhatia) (H. F.) .. 84		— Observations on the Composition of Butter imported into (Bunce) (O. A.) .. 326		Cattell, H. W. Edited by—International Clinics, Vol. I, Forty-second series, 1932 .. 648
— Stones in the, Notes on two unusual cases of (Ahmed Bakhs) (H. P.) .. 522		Burn, J. H.	Recent Advances in Materia Medica .. 534	— Edited by—International Clinics, Vol. III, Forty-first Series, 1931 .. 648
Blood Pressure, The Significance of a Raised (C. T.) .. 39		Burns and Scalds (C. T.) .. 108		— International Clinics, Vol. IV .. 534
Blood, Sugar in the, of Diabetic and Non-diabetic Indian Subjects (Bose) (O. A.) .. 541		— and Scalds, The Modern Treatment of (C. T.) .. 644		Cerebellar localization, A case of malaria with (Burke) (H. F.) .. 197
Bogert, L. J.	Nutrition and Physical Fitness .. 228	'Burnt-out' Cases of Leprosy, Relapse of Active Signs in (Roy) (O. A.) .. 12		Ceylon, The Protection of the interior of, from Plague with Special Reference to the Fumigation of Plague-suspect Imports (C. T.) .. 283
Bombay Medical Council (M. N.) .. 278		Burrows, H.	Some Factors in the Localization of Disease in the Body .. 593	Chatterjee, S. The place of Psychiatry in the Medical Colleges and Schools in India .. 718
— Journal (M. N.) .. 214		Butcher, D. see Napier, L. E. and Das Gupta, C. R.	Field Experiments with Atebrin and Plasmochin .. 186	— S. N. Pre-Natal Dentition .. 57
Boot's Non-Surgical Treatment for Swallowed Foreign Bodies (C. T.) .. 642		Butter imported into Burma, Observations on the composition of (Bunce) (O. A.) .. 326		

	Page		Page		Page
Dhunjibhoj, J. E. Sulphur Treatment in Mental Diseases ..	612	Dysphagia due to Round Worms, A case of (Row) (H. P.) ..	626	Findlay, L. <i>The Rheumatic Infection in Childhood</i> ..	48
Diabetes Mellitus, Increased Carbohydrate in the Treatment of (C. T.) ..	526	E		Fischl, V. and Schlossberger, H. <i>Handbuch Der Chemotherapie</i> ..	593
— Mellitus, The Oral Treatment of; An Explanation of the Synthalin System (C. T.) ..	584	Earache, The Common Causes of (C. T.) ..	221	Fishberg, M. <i>Pulmonary Tuberculosis. Vols. I and II</i> ..	648
Diabetic and Non-Diabetic Indian subjects, A study of the Distribution of Sugar in the Blood of (Bose) (O. A.) ..	541	Ectopia Vesicæ, Implantation of the ureters for inoperable vesico-vaginal fistula and a new technique (Green-Armytage) (S. A.) ..	631	Fitzgerald, G. H. A Mycetoma-like Condition of the Foot ..	517
Dickson, F. D. <i>Posture: Its relation to Health</i> ..	171	Edge, P. G. <i>Vital Records in the Tropics</i> ..	531	— G. H. An Outbreak of Exfoliative Glossitis in an Assam Jail ..	556
Diet, The Influence of, on Pregnancy and early Infant Mortality in India (Balfour and Talpade) (O. A.) ..	601	Elliot, H. L. The Dosage of Intravenous Mercurochrome ..	296	— G. H. and Dey, N. C. Unusual Types of Primary Lesions in Yaws ..	82
Dietaries in India, The Calcium Content of the Common (Sahu) (O. A.) ..	140	Ellman, P. <i>Chest Disease in General Practice</i> ..	286	Fletcher, T. B. <i>Catalogue of Indian Insects. Part 20—Allucitida</i> ..	173
Dikshit, B. B. Alepol in Leprosy ..	7	Emerson, C. P. and Brown, N. G. <i>Essentials of Medicine</i> ..	290	Focal Sepsis as a Cause of Nephritis (C. T.) ..	643
— B. B. see Chopra, R. N. and Chowhan, J. S. Berberine and Berberine-containing plants in Pharmacology and Therapeutics ..	194	Endocarditis, A Case of Acute (Sanyal) (H. P.) ..	572	Fœtus, Disintegrated, Discharged through Abdominal Wall (Lakhoti) (H. P.) ..	267
— B. B. and Rao, D. H. Percain in Spinal Anesthesia ..	69	Enema: Its use and abuse (C. T.) ..	528	— Post-mortem Delivery of a (Nagendran) (H. P.) ..	571
Diphtheria at Rajkot, A short account of a recent outbreak of, with special reference to the carrier problem (Hance, Trivedi and Chhaya) (O. A.) ..	552	Entamæba histolytica in the Urine, A Case with (Cropper and Mitra) (H. P.) ..	387	Food Fats, of Bengal, The Vitamine Value of the (Brahmachari) (O. A.) ..	377
— in a Surgical Wound (Nigam) (H. P.) ..	141	Enteric Infections, A routine combined method of 'Widal Reaction and Clot Culture' for the diagnosis of (Soman) (O. A.) ..	15	Foreign Bodies, Swallowed, Dr. Boot's Non-Surgical Treatment for (C. T.) ..	642
Dobell, C. Anthony Van Leeuwenhoek and His 'Little Animals' ..	709	Enteric-like fever due to <i>Bacillus alkaligenes</i> , A case of severe (Srinivasan) (H. P.) ..	569	— Body in the Air Passages, An Unusual case of (Lal) (H. P.) ..	522
Doctor under the Soviet (C. T.) ..	646	Epidemic Dropsy Glaucoma (Kirwan) (S. A.) ..	636	Fracture of the Carpal Scaphoid, A Radiological Study of Thirty Cases (Torpy) (H. P.) ..	265
Douglas, A. C. <i>The Physical Mechanism of the Human Mind</i> ..	714	— Dropsy Problem, The Classification and Grading of Different Qualities of Indian Rices in Connection with the (Acton) (S. A.) ..	640	Francis, A. <i>The Francis Treatment of Asthma</i> ..	649
Dracontiasis in Chitaldrug District, An Epidemiological and Experimental Study of (Moorthy) (O. A.) ..	498	Epilepsy, Generalised, Caused by Dural Cyst (Mahadevan and Menon) (O. A.) ..	681	Frazer, J. E. <i>A Manual of Embryology</i> ..	115
— Treatment and Prophylaxis of (Moorthy) (O. A.) ..	617	Epipharynx, An Interesting Case of Fibromyxoma of the Epipharynx, An Interesting Case of (Matloob Khan) (H. P.) ..	389	Furniss, A. <i>Ultra-Violet Therapy</i> ..	172
Drink, National, of the Hillfolk of Darjeeling (Ray) (O. A.) ..	551	Equine Pregnancy, A brief note on the diagnosis of, by biological test (C. T.) ..	223	G	
Drugs Enquiry Committee, The Report of the (E.) ..	29	Erysipelas, A case of (Torpy) (H. F.) ..	628	Gallichan, W. M. <i>The Critical Age of Woman</i> ..	533
— in India, The Biological Assay of (E.) ..	573	Ewart, E. D. <i>A Guide to Anatomy</i> ..	406	Gardiner, F. <i>Handbook of Skin Diseases. 3rd edn.</i> ..	112
— New, See Notes ..		Exostoses, Unilateral, A case of Multiple (Dutt Gupta) (H. P.) ..	142	Garton Prize, 1931 (M. N.) ..	395
Dryerre, H. <i>Aids to Physiology</i> ..	172	Eyelid Clamp, A New (Cruickshank) (H. F.) ..	82	Gastric Hyperacidity (C. T.) ..	42
Dugdale, J. N. <i>Health in Hot Climates. 2nd Edn.</i> ..	173	F		Ghadialli, D. S. An Advanced Case of Ricketts Treated by Ossin ..	453
Duke-Elder, W. S. <i>Textbook of Ophthalmology</i> ..	530	Faculty of Tropical Medicine, Bengal, Examination Result (D. T. M.) held in April, 1932 (M. N.) ..	277	Gharpurey, K. G. Some Snake-bite Cases ..	81
Dural Cyst, Generalised Epilepsy, Caused by a (Mahadevan and Menon) (O. A.) ..	681	— of Tropical Medicine, Bengal. Result of L. T. M. Examination, Session 1931 (M. N.) ..	38	Ghi, Pure Buffalo, Constants of (Brahmachari) (O. A.) ..	623
Dutt, K. N. A Case of Rat-bite Fever ..	268	— of Tropical Medicine, Bengal. Result of L. T. M. Examination, Session 1932 (M. N.) ..	704	Ghosal, J. N. A Case of Granuloma Inguinale ..	523
Dutta, N. C. Notes on a Case of Gonorrhœal Arthritis Treated by Injection of Milk ..	142	Fagge, C. H. <i>The Acute Abdomen</i> ..	227	Ghose, K. K. see De, J. C., Laha, K., and Acharya, A. K. The Significance of the Widal Reaction and other Laboratory Findings in Typhoid Fever ..	366
— P. C. A Contribution to the Surgery of Fascial Transplantation ..	326	Fairbairn, D. K. Delayed birth of the Second Twin ..	389	— L. M. An Unusual Case of Sporotrichosis ..	570
Dutt Gupta, A. K. A Case of Multiple Unilateral Exostoses ..	142	— D. K. A Large Ovarian Cyst ..	519	Ghosh, P. K. Microfilaria in the Sputum ..	84
— A. K. A Case of Volvulus of the whole of the small intestines ..	142	Fascial Transplantation, A Contribution to the Surgery of (Dutta) (O. A.) ..	326	— Dastidar, S. K. see Bose, A. N. The Protective Value of T. A. B. Inoculation as Indicated by the Agglutinating Power of the Serum ..	504
Dysentery in Burma (Military Stations) with a note on some post-dysenteric infections (Wats and Jafar) (O. A.) ..	446	Fever, Bandicoot-bite, A case of (Pillai) (H. P.) ..	628	Gill, C. A. The Determination of Sex ..	269
		Fibromyxoma of the Epipharynx, An Interesting case of (Matloob Khan) (H. P.) ..	389	Glaucoma, The Diagnosis and Treatment of Non-congestive (Kirwan) (O. A.) ..	661
		Filarial Lymphangitis, The Role of Bacteria in Acute (C. T.) ..	219	— Epidemic Dropsy (Kirwan) (S. A.) ..	636
		Filtered Water Supply, <i>Bacillus coli</i> in the Calcutta, A Preliminary Report on (Das Gupta) (O. A.) ..	380	— Some points in connection with the treatment of (C. T.) ..	344
				Glossitis, Exfoliative, in an Assam Jail, An outbreak of (Fitzgerald) (O. A.) ..	556

	Page		Page		Page
Glutal Region, A Case of Large Pedunculated Lipoma of the (Robinson and Seshachalam) (O. A.)	681	Hepatic Dropsy, 'Novasurol' in a case of (Pandya) (H. P.)	388	I	
Gnanadickam, G. J. The Modern Intracapsular Operation for Senile Cataract	559	Hernia, A Case of Strangulated Diaphragmatic (Khan) (H. P.)	521	Ileus, A case of (Umar) (H. P.)	266
Gold Medal, The Rai Shambhu Dayal Sahib (M. N.)	342	and Hydrocele, Bilocular Hydrocele simulating (Lakhoti) (H. P.)	199	Ince, H. T. Acriflavine as a Counter-Stain in the Ziehl-Neelsen Method of Staining	262
Gonorrhoeal Arthritis treated by Injection of Milk, Notes on a case of (Dutta) (H. P.)	142	The mode of action of Atropine in the Reduction of (Rodrigues) (C.)	234	An Epidemic of Jaundice in Alipuram Jail, Bellary, from January to July, 1931	13
Graham, E. A. Edited by— <i>Surgical Diagnosis</i>	113	Herpes of the Nose, A Case of Clinical Malaria with (Iyer) (O. A.)	682	India, The Influence of Diet on Pregnancy and Early Infant Mortality in (Balfour and Talpade) (O. A.)	601
Granuloma Inguinale, A case of (Ghosal) (H. P.)	523	Herrick, C. J. <i>An Introduction to Neurology</i>	170	The Prevention of Heart Affections in (Basu) (O. A.)	566
Graves, W. P. <i>Female Sex Hormonology</i>	226	Hertzel, A. E. <i>Surgical Pathology of the Diseases of Bones</i>	45	Indian Medical Association Meeting (M. N.)	705
Green-Armytage, V. B. <i>Gynaecology in the Tropics</i>	22	A. E. <i>Surgical Pathology of the Genito-Urinary Organs</i>	592	Medical Service Annual Dinner (M. N.)	468
—V. B. Implantation of the Ureters for Inoperable Vesico-Vaginal Fistula and Ectopia Vesicae: A New Technique	631	A. E. <i>Surgical Pathology of the Skin, Fascia, Muscles, Tendons, Blood and Lymph Vessels</i>	348	Science Congress, 1933 (M. N.)	394
—V. B. <i>Obstetrics in the Tropics</i>	144	Hewer, C. L. <i>Recent Advances in Anaesthesia and Analgesia</i>	651	Infant Mortality, early, in India, The Influence of Diet on Pregnancy and (Balfour and Talpade) (O. A.)	601
Greig, D. M. <i>Clinical Observations on the Surgical Pathology of Bone</i>	288	Hexylresorcinol as an Anthelmintic (Maplestone and Mukherji) (O. A.)	610	Infants, Renal Colic in (Adya) (H. P.)	388
Greval, S. D. S. Rabies in the Mongoose	451	Hill, L. <i>Manual of Human Physiology</i>	172	International Congress of Tropical Medicine, Second (M. N.)	214
—The Role of Serology in Rabies	676	Hillfolk of Darjeeling, A National Drink of (Ray) (O. A.)	551	Hospital Association (M. N.)	394
Gupta, N. The Anæmia of Pregnancy	421	Hirst, G. G. Indian Species of Artemesia	119	Society of Microbiology (M. N.)	704
—N. The Anæmia of Pregnancy	658	Hobson, W. A. Population question	357	Intracapsular Operation, The Modern, for Senile Cataract (Gnanadickam) (O. A.)	559
—S. K. see Pasricha, C. L. and DeMonte, A. J. Cholera and Cholera-like Vibriophages	487	Hodge, E. H. V. Rheumatism in India	241	Intradermal Method of Injecting Hydnocarpus Preparations in Leprosy (Muir) (O. A.)	121
—S. K. see Pasricha, C. L. and DeMonte, A. J. Mutation of Cholera Vibrios	64	Holder, J. T. <i>Elementary Histological Technique for Animal and Plant Tissues</i>	230	Intussusception with recovery, Spontaneous separation of an (Sapre) (H. P.)	332
—S. K. see Pasricha, C. L. and DeMonte, A. J. A Preliminary Note on New Types of Cholera 'Phage'—Types D & E	262	Homans, J. <i>A Textbook of Surgery</i>	112	Iodine, The best source of (Organic vs. Inorganic) as related to Thyroid Disturbances (Malhotra) (S. A.)	337
Guthrie, A. C. <i>Research Work on the Pneumococci and their Enzymes and its Significance in Lobar Pneumonia</i>	405	Horn, Sebaceous, A case of (Mukerjee) (O. A.)	22	Ipecacuanha, Indian (Chopra and Mukherjee) (S. A.)	88
Gynaecology in the Tropics (Green-Armytage) (S. A.)	22	Hughes, T. A. Changes in Cardiac Rhythm in a Case of Rheumatic Mitral Disease complicated with Broncho-Pneumonia	718	Isohemagglutination (Mitra)	139
		—T. A. and Yusuf, M. Changes in Cardiac Rhythm in a Case of Rheumatic Mitral Disease complicated with Broncho-Pneumonia	568	Iyer, P. K. V. A Case of Clinical Malaria with Herpes of the Nose	682
H		Human Body, The Defence Mechanism of the (Krishnan) (S. A.)	637	J	
Hadfield, G. and Garrod, L. P. <i>Recent Advances in Pathology</i>	651	Hunter, R. H. <i>Aids to Surgical Anatomy</i>	50	Jafar, M. Malaria in Mingaladon Cantonment, Burma	493
Hæmoglobinuria in certain species of Monkey, Observations on a Plasmodium Infection which causes (Napier and Campbell) (O. A.)	246	Husain, N. Anthrax Pustule of the Neck	517	—M. and Singh, B. Dengue Fever in the Rangoon-Mingaladon Area	674
Halden, H. <i>Bottle Feeding of Infants</i>	714	Hutton, I. E. <i>The Hygiene of Marriage</i>	408	—M. see Wats, R. C. Dysentery in Burma (Military Stations) with a Note on Some Post-Dysenteric Infections	446
Hann, B. <i>Handbook of Sanitary Law for the Use of Candidates for Public Health Qualifications, 1931</i>	172	Hydatid Cyst of the Abdominal Wall, Notes on a Case of Suppurating (Ahmed Bakhsh) (H. P.)	519	Jamal-ud-din. Notes on Cataract in the Funjab	386
Hameed, M. A. A Case of Locomotor Ataxia in an Indian	571	Hydnocarpus Preparations in Leprosy, The Intradermal Method of Injecting (Muir) (O. A.)	121	Jaundice, An Epidemic of, in Alipuram Jail, Bellary, from January to July, 1931 (Ince) (O. A.)	13
Hance, J. B., Trivedi, T. H. and Chhaya, H. M. A Short Account of a Recent Outbreak of Diphtheria at Rajkot, with special reference to the carrier problem	552	Hydro-Creol Injections, Reactions following (Pattanayak) (H. P.)	86	—An Epidemic of, in the Alipuram Jail, Bellary (South India) (Pandit and Rao) (O. A.)	77
Harrogate Medical Society. <i>Compiled by—Spa Treatment</i>	47	Hydrocele, Hernia and, Bilocular Hydrocele simulating (Lakhoti) (H. P.)	199	Jayawardene, B. S. Massive Iron Dosage for Chronic Secondary Anæmias	417
Heart Affections in India, The Prevention of (Basu) (O. A.)	566	Hydrophobia, The Treatment of (King) (C.)	357	Jewell, N. P. and Kaunitz, W. H. <i>Handbook of Tropical Fevers</i>	287
Henry, G. W. <i>Essentials of Psychiatry</i>	115	Hyperacidity, Gastric (C. T.)	42	Jewesbury, R. C. <i>Mother Craft: Antenatal and Postnatal</i>	650
				Joll, C. A. <i>Diseases of the Thyroid Gland</i>	227
				Jordan, E. O. <i>Textbook of General Bacteriology, 10th Edn.</i>	114

	Page		Page		Page
K					
Kala-azar and Associated Conditions, Cytological Studies of the Blood and Tissues in (Part II: Morphology of the Leucocytes in Supra-vital Preparations) (Krishnan, Lal and Napier) (O. A.) ..	130	Krishnan, K. V. <i>see</i> Napier, L. E. and Lal, C. Cytological Studies of the Blood and Tissues in Kala-azar and Associated Conditions. Part I. Supra-vital Staining Technique ..	251	Leprosy Association, The International (M. N.) ..	161
— and Associated Conditions, Cytological Studies of the Blood and Tissues in (Part III: Large Mononuclear Cells in Human Malaria) (Napier, Krishnan and Lal) (O. A.) ..	135	— K. V. <i>see</i> Napier, L. E. and Lal, C. Cytological Studies of the Blood and Tissues in Kala-azar and Associated Conditions. Part III: Large Mononuclear Cells in Human Malaria ..	135	— in India (Lowe) (S. A.) ..	208
— Cytological Studies of the Blood and Tissues in, and Associated Conditions, Part I. Supra-vital Staining Technique (Napier, Krishnan and Lal) ..	251	Kundu, M. L. A Case of Typhus Fever in Rangoon ..	390	— The Intradermal Method of Injecting Hydnocarpus Preparations in (Muir) (O. A.) ..	121
— The Pentavalent Compounds of Antimony in the Treatment of (C. T.) ..	403	Kurup, P. R. <i>The Snake Poison and Various other Poisons how treated</i> ..	172	— Mercurochrome in, A Corrigendum (Rao and Roy) (C.) ..	417
— The Prognostic Value of the Aldehyde Reaction in (Chopra and Chaudhury) (O. A.) ..	260	L			
Karsner, H. T. <i>Human Pathology: A Textbook</i> ..	348	Laha, K. <i>see</i> De, J. C., Acharya, K. and Ghose, A. K. The Significance of the Widal Reaction and other Laboratory Findings in Typhoid Fever ..	366	— Relapse of Active Signs in 'Burnt-out' Cases of (Roy) (O. A.) ..	12
Keith-Thompson, M. <i>A Practical Guide to the Edinburgh F.R.C.S.</i> ..	173	Lakhoti, B. Bilocular Hydrocele Simulating Hernia and Hydrocele ..	199	— Work, Mercurochrome-220 Soluble in (Rao and Roy) (O. A.) ..	124
Kessler, H. H. <i>Accidental Injuries: The Medico-Legal Aspects of Workmen's Compensation and Public Liability</i> ..	47	— B. Disintegrated Fœtus Discharged through Abdominal Wall ..	267	Leucorrhœa (C. T.) ..	283
Khan, H. <i>Elements of Embryology</i> ..	521	Lakshmi, N. A Case of Cerebro-spinal Meningitis ..	331	Levin, L. <i>Phantastica-Narcotic and Stimulating Drugs: Their Use and Abuse</i> ..	406
— M. Y. A Case of Strangulated Diaphragmatic Hernia ..	267	Lal, C. <i>see</i> Krishnan, K. V. and Napier, L. E. Cytological Studies of the Blood and Tissues in Kala-azar and Associated Conditions. Part II: Morphology of the Leucocytes in Supra-vital Preparations ..	251	Lipoma, Pedunculated of the Gluteal Region, A Case of Large (Robinson and Seshachalam) (O. A.) ..	681
Khandekar, K. G. A Noseless Man ..	679	— C. <i>see</i> Napier, L. E. and Krishnan, K. V. Cytological Studies of the Blood and Tissues in Kala-azar and Associated Conditions. Part I. Supra-vital Staining Technique ..	251	Literary Notes. <i>See</i> Notes	
Kidney, A Case of Congenital Single, with Dilated Ureter (Chopra and Bose) (O. A.) ..	49	— C. <i>see</i> Napier, L. E. and Krishnan, K. V. Cytological Studies of the Blood and Tissues in Kala-azar and Associated Conditions. Part III: Large Mononuclear Cells in Human Malaria ..	135	Liver Abscess, A Note on Treatment of, by Aspiration (Bhandari) (O. A.) ..	682
Kilduffe, R. A. <i>The Clinical Interpretation of Blood Examinations</i> ..	358	— K. M. An Unusual Case of Foreign Body in the Air Passages ..	522	— Extract, Intravenous, Resistant Sprue Anæmia Yielding to (C. T.) ..	400
King, H. H. <i>The Treatment of Hydrophobia</i> ..	45	Lattes, L. <i>The Individuality of the Blood in Biology and in Clinical and Forensic Medicine</i> ..	588	— Function, The Use of Avertin in the Presence of Damaged (C. T.) ..	587
Kirschner, M. <i>Operative Surgery: General and Special Considerations</i> ..	661	Lawrence, R. D. <i>The Diabetic A-B-C: A Practical Book for Patients and Nurses</i> ..	650	Lloyd, R. B. <i>The Interpretation of Wassermann Results in India</i> ..	1
Kirwan, E. W. O'G. <i>The Diagnosis and Treatment of Non-Congestive Glaucoma</i> ..	636	League of Nations, Public Health Intelligence of the Health Organisation of the (Rajchman) (C.) ..	539	Lowe, J. Leprosy in India ..	208
— E. W. O'G. <i>Epidemic Dropsy Glaucoma</i> ..	636	— of Nations. <i>Publication of—Conference on the Limitation of the Manufacture of Narcotic Drugs</i> ..	172	Lungs, A Case of Syphilis of the (Sapre) (H. P.) ..	21
Knowles, R., and Das Gupta, B. M. <i>Clinical Studies in Malaria by Cultural and Enumerative Methods. Second Series</i> ..	432	Leech, Invasion of the Nasal Cavity by a (Matloob Khan) (H. P.) ..	389	Lymphangitis, Filariæ, The Role of Bacteria in Acute (C. T.) ..	219
— R. and Das Gupta, B. M. A Study of Monkey-Malaria and its Experimental Transmission to Man. (See also correction, p. 701) ..	301	Leech in the Nasal Cavity (Narasimhaiah) (H. P.) ..	572	M	
Koch, Robert (E.) ..	697	Lees, D. <i>Practical Methods in the Diagnosis and Treatment of Venereal Diseases</i> ..	169	Madan, K. E. <i>Elementary and Advanced Textbook of Anæsthesia</i> ..	50
Koch's Discovery of the Tubercle Bacillus (Shrikhande) (O. A.) ..	691	Leishman Prize (M. N.) ..	641	Mahadevan, V. and Menon, T. B. Generalised Epilepsy Caused by a Dural Cyst ..	681
Krishnamurthy, M. N. <i>The Os Naviculare Pedis</i> ..	296	Lejars, F. <i>Clinical Examination and Surgical Diagnosis</i> ..	226	Maingot, R. H. <i>The Management of Abdominal Operations</i> ..	49
Krishnan, K. V. <i>The Defence Mechanism of the Human Body</i> ..	637	Leprosy, Alepol in (Dikshit) (O. A.) ..	7	Maity, B. B. <i>see</i> Malliya, B. G. The Curative Value of a Locally Prepared Sample of Sulpharsenobenzene-Thiosarmin. Part II ..	249
— K. V., Lal, C. and Napier, L. E. Cytological Studies of the Blood and Tissues in Kala-azar and Associated Conditions, Part II: Morphology of the Leucocytes in Supra-Vital Preparations ..	130	— Alepol in the Treatment of (Bhandari) (O. A.) ..	244	'Makaradhwaja' (Sulphide of Mercury), A Preliminary Note on the Absorption of (Chopra and Mukherjee) (O. A.) ..	448

	Page		Page		Page
Malaria, Malignant Tertian, A Fatal Case of Severe (Chopra, Das Gupta and Sen) (O. A.) ..	680	Menthol, Thymol and Camphor from Indian Sources (Chopra and Mukherjee) (O. A.) ..	361	Mukerjee, P. A Case of Sebaceous Horn ..	22
— in Mingaladon Cantonment, Burma (Jafar) (O. A.) ..	493	Mercurial Poisoning, Sodium Thiosulphate in (Mehta) (C.) ..	296	Mukherjee, S. B. A Case of Cerebral Malaria ..	387
— Observations on, in Puri District, Orissa (Sarathy) (O. A.) ..	254	Mercurochrome, The Dosage of Intravenous (Elliot) (C.) ..	296	Mukherji, A. K. <i>see</i> Maplestone, P. A. Hexylresorcinol as an Anthelmintic ..	610
— A Study of Induced Malignant Tertian (E.) ..	698	— in Leprosy. A Corrigendum (Rao and Roy) (C.) ..	417	Mukerji, D. M. Cases of Tick-Typhus in a Town ..	86
— Two Interesting Cases of (Bhattacharyya) (H. P.) ..	571	Mercurochrome-220 Soluble in Leprosy Work (Rao and Roy) (O. A.) ..	124	Mung Dal, Papain Digest of (Phaseolus Mungo) Green Variety, A New Vegetable Culture Medium made from the (Acton, Pasricha, Roy and Das Gupta) (O. A.) ..	619
Malarial Gametocide, Plasmochin as a (Sur, Sarkar and Banerji) (O. A.) ..	490	Meyer, H. <i>Clinical Roentgen Pathology of Thoracic Lesions</i> ..	714	Musk: Its Pharmacological Action and Therapeutic Uses (Chopra and Mukherjee) (O. A.) ..	321
— Splens, Milk Injections in (Singh) (O. A.) ..	498	Microbiology, The International Society of (M. N.) ..	704	Mustard in Pneumonia, The use of (Biswas) (C.) ..	296
Malaya, Notes on a Brief Tour in (Senior-White) (S. A.) ..	683	Microfilariae in the Sputum (Ghosh) (H. F.) ..	84	— The uses of, in Medicine. (Correspondent) (S. A.) ..	27
Malhotra, R. C. The Best Source of Iodine (Organic <i>vs.</i> Inorganic) as related to Thyroid Disturbances ..	337	Milk, Injection of, Gonorrhoeal Arthritis treated by (Dutt) (H. P.) ..	142	Mycetoma-like Condition of the Foot (Fitzgerald) (H. F.) ..	517
Mallya, B. G. and Maity, B. B. The Curative Value of a Locally prepared Sample of Sulpharsenobenzene — Thio-sarmin. Part II ..	249	— Injections in Malarial Splens (Singh) (O. A.) ..	498		
Mangalik, V. S. <i>see</i> Rahman, M. A. A case of Brodie's Abscess ..	627	Miller, A. A. <i>Bendien's Diagnostic Methods for Cancer and Principles of Treatment</i> ..	115	N	
Maplestone, P. A. The Testing of Anthelmintics ..	673	Minto Memorial Medal, The (M. N.) ..	214	N. A. B., The Treatment of Anthrax by (C. T.) ..	220
— F. A. and Mukherji, A. K. Hexylresorcinol as an Anthelmintic ..	610	Mitra, J. <i>see</i> Cropper, C. F. J. A Case of <i>Entamoeba histolytica</i> in the Urine ..	387	Nagendran, R. Post-mortem Delivery of a Foetus ..	571
Marshall, C. F. <i>A New Theory of Cancer, and its Treatment</i> ..	532	— P. N. Isohaemagglutination ..	139	Napier, L. E., Butcher, D. and Das Gupta, C. R. Field Experiments with Atebrin and Plasmochin ..	186
Matloob Khan. An Interesting Case of Fibromyxoma of the Epipharynx ..	389	Mongoose, Rabies in the (Grevál) (O. A.) ..	451	— L. E. and Campbell, H. G. M. Observations on a Plasmodium Infection which causes Haemoglobinuria in Certain Species of Monkey (<i>See</i> also correction, p. 701) ..	246
— Invasion of the Nasal Cavity by a Leech ..	389	Monkey, Observations on a Plasmodium Infection which causes Haemoglobinuria in certain species of (Napier and Campbell) (O. A.) (<i>See</i> also correction, p. 701) ..	246	— L. E. and Das Gupta, B. M. Atebrin: A Synthetic Drug for the Treatment of Malaria ..	181
McCay, F. H. The Treatment of Bacillary Dysentery by Bacteriophage ..	666	Monkey-Malaria and its Experimental Transmission to Man (Knowles and Das Gupta) (O. A.) (<i>See</i> also correction, p. 701) ..	301	— L. E., Krishnan, K. V. and Lal, C. Cytological Studies of the Blood and Tissues in Kala-azar and Associated Conditions, Part I: Supravital Staining Technique ..	251
McDowall, R. J. S. <i>The Science of Signs and Symptoms</i> ..	288	Montague, J. F. <i>The Modern Treatment of Haemorrhoids</i> ..	45	— L. E. <i>see</i> Krishnan, K. V. and Lal, C. Cytological Studies of the Blood and Tissues in Kala-azar and Associated Conditions, Part II: Morphology of the Leucocytes in Supra-vital Preparations ..	130
McGuire, C. The Etiology of Blackwater Fever ..	658	Moorthy, V. N. An Epidemiological and Experimental Study of Dracontiasis in Chitaldrug District ..	498	— L. E., Krishnan, K. V. and Lal, C. Cytological Studies of the Blood and Tissues in Kala-azar and Associated Conditions, Part III: Large Mononuclear Cells in Human Malaria ..	135
McLeod, C. C. The Ross Institute ..	718	— V. N. Treatment and Prophylaxis of Dracontiasis ..	617	Narasimhaiah, H. A Leech in the Nasal Cavity ..	572
McLester, J. S. <i>Nutrition and Diet in Health and Disease</i> ..	46	Morgan, W. G. <i>Functional Disorders of the Gastro-Intestinal Tract</i> ..	287	Narayanrao, U. B. <i>Materia Medica of Pharmaceutical Combinations and Specialities</i> ..	592
Medical Colleges and Schools in India, The Place of Psychiatry in the (Berkeley-Hill) (S. A.) ..	578	Moringa pterygosperma (N. O. Moringae), The Alkaloid of, A Preliminary Note on the Action of (Chopra and De) (O. A.) ..	128	Nasal Cavity, Invasion of the, by a Leech (Matloob Khan) (H. P.) ..	389
— Colleges and Schools in India, The Place of Psychiatry in the (Chatterjee) (C.) ..	718	Morton, H. <i>Diseases of the Stomach</i> ..	49	— Cavity, A Leech in the (Narasimhaiah) (H. P.) ..	572
— Council Bill, The All-India (M. N.) ..	32	Mosquito, The Behaviour of Plasmodia in the, after treatment of the Human Host with Atebrin (Strickland and Roy) (O. A.) ..	191	Needham, D. M. <i>The Biochemistry of Muscle</i> ..	405
— Research Workers, The Ninth All-India Conference of (M. N.) ..	103	Mudaliar, A. L. and Menon, C. K. A New Conception in the Treatment of Puerperal Sepsis ..	606	'Negative Phase' in Prophylaxis by Inoculation of Vaccines (Stewart) (S. A.) ..	515
Medicine, Snake Venoms in (Chopra and Chowhan) (S. A.) ..	574	Muir, E. The Intradermal Method of Injecting Hydnocarpus Preparations in Leprosy ..	121	Nembutal and Chloral in Child-birth, Observations on the use of (C. T.) ..	395
Mehta, B. N. Sodium Thiosulphate in Mercurial Poisoning ..	296	Mukherjee, B. <i>see</i> Chopra, R. N. Indian Chenopodium ..	5	Neostibosan in Chyluria (Sherwani) (H. P.) ..	83
Meniere's Disease (C. T.) ..	41	— B. <i>see</i> Chopra, R. N. Indian Ipecacuanha ..	88		
Meningitis, Cerebrospinal, A case of (Lakshmi) (H. P.) ..	331	— B. <i>see</i> Chopra, R. N. Musk: Its Pharmacological Action and Therapeutic Uses ..	321		
Menon, C. K. <i>see</i> Mudaliar, A. L. A New Conception in the Treatment of Puerperal Sepsis ..	606	— B. <i>see</i> Chopra, R. N. A Preliminary Note on the Absorption of 'Makaradhwaja' (Sulphide of Mercury) ..	448		
— T. B. <i>An Introduction to Tropical Pathology</i> ..	592	— B. <i>see</i> Chopra, R. N. Thymol, Menthol and Camphor from Indian Sources ..	361		
— T. B. <i>see</i> Mahadevan, V. Generalised Epilepsy caused by a Dural Cyst ..	681				
Mental Diseases, Sulphur Treatment in (Dhunjibhoj) (O. A.) ..	612				

	Page		Page		Page
Neostibosan-Di-Ethyl-Amine Para- Amino-Phenyl Stibi- bate; 254 Cases (C. T.) ..	403	Notes—concl'd.		Percain in Spinal Anaesthesia (Dikshit and Rao) (O. A.) ..	69
Nephritis, Focal Sepsis as a Cause of (C. T.) ..	643	The Dispert Preparations	58	Ferera, D. Asphyxia Pallida ..	22
————— Laboratory Tests and the General Practitioner in the Diagnosis and Treat- ment of (C. T.) ..	215	The Injection Treatment of Vari- cose Veins ..	240	Pessary, Cervical. A Menace to Health and Life (C. T.) ..	474
New Drugs. See Notes		The B. D. H. Urecometer Outfit	180	Peters, J. P. and van Slyke, D. D. Quantitative Clinical Chemistry. Vol. II. Methods ..	652
Newman, C. Medical Emergencies	170	The Royal Institute of Public Health ..	540	'Phage, Cholera, A Preliminary Note on New Types of—Types D and E (Pasricha, DeMonte and Gupta) (O. A.) ..	262
Nigam, K. S. Diphtheria in a Surgical Wound ..	141	The Value of Vitamins A and D in Tuberculosis ..	59	Pharmacy, The Profession of (E.)	211
North Persian Forces Memorial Medal (M. N.) ..	641	The B. T. L. Monthly Bulletin ..	60	Pillai, M. D. A Case of Bandi- coot-Bite Fever ..	628
Noseless Man, A (Khandekar) (H. F.) ..	267	'Theelin', Parke, Davis & Co. ..	298	Pillay, A. P. More about the Population Problem ..	357
Notes.		Two Useful Timekeepers ..	659	Plague, Cholera, Smallpox and, in India in 1931 and Fore- cast for 1932, Result of the Forecast of (Rogers) (O. A.) ..	61
An Electric Ophthalmoscope. By N. Bishop Harman, F.R.C.S. ..	239	Uroselectan-B ..	360	————— in the Field. Notes on the Study of (Webster) (S. A.) ..	693
A Modified Thomas' Hip Splint. By H. E. Rawlence, M.D., F.R.C.S. ..	298	Watsons' Microscope Record ..	360	————— The Protection of the Interior of Ceylon from, with Special Reference to the Fumigation of Plague-suspect Imports (C. T.) ..	283
A New Suture-Holding Forceps. By W. H. Ogilvie ..	179	X-Ray Films ..	239	————— The Serum Therapy of (C. T.) ..	278
A New Craniotomy Forceps. By Dr. Millicent Vere Webb ..	240	Nott, H. W. The Thyroid and Manganese Treatment ..	170	————— Three Cases of, Treated with 'Bayer 205' (Rao) (H. P.) ..	626
An Uterine Cannula for the Rubin Test. By W. C. Spackman, F.R.C.S.E., Major, I.M.S. ..	180	'Novasuro' in a Case of Hepatic Dropsy (Pandya) (O. A.) ..	388	Plasmochin, Atelbrin and, Field Experiments with (Napier, Butcher and Das Gupta) (O. A.) ..	186
A New Tonsil Guillotine. By Dr. T. B. Jobson ..	300	Nurses' Charter (E.) ..	273	————— as a Malarial Gameto- cide (Sur, Sarkar and Banerji) (O. A.) ..	490
A Nurses' Appointment Bureau ..	300	Nutrition, Abstracts and Reviews (M. N.) ..	215	Plasmodia, The Behaviour of, in the Mosquito after treatment of the Human Host with Atelbrin (Strickland and Roy) (O. A.) ..	191
An Anaesthetic Mask for Ophthal- mic Use. By R. Burns, M.B. ..	359	O		Plasmodium Infection. Observa- tions on a, which causes Haemoglobin- uria in certain species of Monkey (Napier and Campbell) (O. A.) (See also correc- tion, p. 701) ..	246
A Device for Preventing Glare in Electric Ophthalmoscopes. By N. Bishop Harman ..	418	Obstetrics in the Tropics (Green- Armytage) (S. A.) ..	144	————— Ovale Stephens, 1922 (E.) ..	630
An Illuminated Direct Laryngo- pharyngoscope. By E. Watson- Williams ..	419	Ochs, G. Catalogue of Indian Insects. Part 19—Gyrinoidea ..	173	Pneumonia. The use of Mustard in (Biswas) (C.) ..	296
An Electric Fitting for Testing Temperature Sensation. By Dr. H. Wolfe Corner, M.D. ..	420	Ophthalmology, The Ninth Post- graduate Course in (Vienna 1932) (M. N.) ..	160	Polypus, Rhinosporidium, in a Hindu Woman (Smith) (H. P.) ..	458
A Biopsy and Skin Graft Forceps. By A. Dickson Wright ..	479	Opium Addiction, Psychological Aspects of (Berkeley-Hill) (C.) ..	119	Population Problem (C. T.) ..	163
A New Sigmoidoscopic Scoop. By M. A. Arafa ..	480	Orcl, G. H. Allergy ..	649	————— Problem, More about the (E.) ..	153
An Emergency Outfit for Burns A Century of Progress ..	540	'Os Naviculare Pedis', The (Krishnamurthy) (C.) ..	296	————— Problem, More about the (Hobson) (C.) ..	356
A New Bone Drill. By A. Simp- son Smith ..	598	Ossin, An Advanced Case of Rickets treated by (Ghadialli) (H. F.) ..	453	————— Problem, More about the (Pillay) (C.) ..	356
A New Abdominal Retractor. By Miss M. V. Webb ..	600	Osteomyelitis, The Baer Maggot Treatment of (C. T.) ..	401	————— Problem, Welfare Work and the (E.) ..	336
An Excellent and Hygienic Sub- stitute for Water and Air Beds	659	Ovarian Cyst, A large (Fairbairn) (H. P.) ..	519	Porter, C. and Fenton, J. Sani- tary Law—In Question and Answer ..	406
A New Bone Clamp for Fractures. By A. Simpson Smith ..	660	P		Post-graduate Courses in Berlin. International Medical (M. N.) ..	641
'Bisoxyl', B. D. H.' ..	359	Pal, B. B. Khadya-Tattva or the Principles of Dietetics. (Writ- ten in Bengali) ..	650	Post-mortem Delivery of a Fetus (Nagendran) (H. P.) ..	571
Borocaine ..	59	Pandit, C. G. and Rao, R. S. An Epidemic of Jaundice in the Alipuram Jail, Bellary (South India) ..	77	Pregnancy, The Anaemia of (Gupta) (O. A.) ..	421
Bovril, Ltd. ..	480	Pandya, D. N. 'Novasuro' in a Case of Hepatic Dropsy ..	388	————— The Anaemia of (C.) ..	658
Carotene B. D. H. ..	120	Paraldehyde, Chloral Hydrate and, as Drugs of Addiction (Chopra and Chopra) (O. A.) ..	481	————— Aolin in (Sircir) (C.) ..	234
Catalsan ..	299	Parfitt, J. B. Operative Dental Surgery ..	171	————— The Influence of Diet on, and Early Infant Mortality in India ..	601
'Haliverol', Parke, Davis & Co. 'Health in the Making' Cinema Films ..	539	Parkes Memorial Prize (M. N.) ..	523	————— The Results of one thousand Aschheim- Zondek Tests for ..	642
'Hypoloid' 'Epinalin', B. W. & Co. (Adrenalin and Ephedrine Solution) ..	60	Parry, L. A. Criminal Abortion —S. C. Lascar Hindustani for Ship-Surgeons ..	47	Toxaemia, The Early Diagnosis and Treat- ment of (C. T.) ..	707
Imitations of Antiphlogistine ..	299	Parulkar, M. V. Crystallized Therapy ..	649		
International Co-operation in the Hospital Field ..	600	Pasricha, C. L. see Acton, H. W., Roy, A. C. and Das Gupta, S. M. A New Vegetable Culture Medium made from the Papain Digest of Mung Dal, Green Variety ..	619		
Lactogen ..	298	————— C. L., DeMonte, A. J. and Gupta, S. K. Cholera and Cholera-like Vibrio- phages ..	487		
Livogen, B. D. H. ..	298	————— C. L., DeMonte, A. J. and Gupta, S. K. Muta- tion of Cholera Vibrios ..	64		
London Medical Exhibition ..	120	————— C. L., DeMonte, A. J. and Gupta, S. K. A Preliminary Note on New Types of Cholera 'Phage' —Types D and E ..	262		
Merck's Annual Report, 1931, Part III ..	420	Pattanayak, S. S. Reactions follow- ing Hydno-Creol Injections ..	86		
Mercollloid ..	300	Pelouze, P. S. Gonorrhoea in the Male and Female ..	713		
Messrs. N. Powell & Co., Bombay	598	Penis, A case of complete absence of the (Sen Roy) (H. F.) ..	518		
'Multibral' ..	540				
Neotropin, Schering ..	299				
'Peptalac', Cow & Gate, Ltd. ..	599				
Pill Alophen, Parke, Davis & Co.	360				
'Radiostol', B. D. H.' ..	419				
Shado-Cream B. D. H. For use in X-ray Diagnosis ..	59				
Stable Preparations of Digitalis ..	660				
Sub-Acidosis and Salivæ ..	659				
Surgical Diathermy ..	359				

	Page		Page		Page
Pregnancy, The Tropical Anæmia of (E.) ..	459	Reports—(See Annual Reports)	388	Reviews—contd.	
Premedication (C. T.) ..	166	Renal Colic in Infants (Adya) (H. P.) ..	388	Blood Serum, Specific Changes in the: A Contribution to the Serological Diagnosis of Cancer and Tuberculosis (S. G. T. Bendien) ..	531
Pre-natal Dentition (Chatterjee) (C.) ..	57	Reticulo-Endothelial System and Some Diseases in the Tropics (Bhattacharjee) (S. A.) ..	271	Bone, Surgical Pathology of, Clinical Observations on the (M. Greig) ..	288
Prinzhorn, H. <i>Psychotherapy: Its Nature—Its Assumptions—Its Limitations: A Search for Essentials</i> ..	530	Reviews.		Bones, Surgical Pathology of the Diseases of (A. E. Hertzler) ..	45
Profession of Pharmacy (E.) ..	211	Abdomen, The Acute (C. N. Fagge) ..	227	Bottle Feeding of Infants (H. Halden) ..	714
Psychiatry in the Medical Colleges and Schools in India, The Place of (Chatterjee) (C.) ..	718	Abdominal Operations, The Management of (R. H. Maingot) ..	49	Brain and Spinal Cord (E. Billiger) ..	227
—The Place of, in the Medical Colleges and Schools in India (Berkeley-Hill) (S. A.) ..	578	Abortion, Criminal (L. A. Farry) ..	289	—Tumours, The Diagnosis and Treatment of (E. Sachs) ..	112
Ptomaine Poisoning due to Unclean Degchies, A Case of Blackwater Fever Precipitated by (Reynolds) (H. F.) ..	198	Acromegaly (F. R. B. Atkinson) ..	715	Breast, Tumours of the: Their Pathology, Symptoms, Diagnosis and Treatment (G. L. Cheatle) ..	347
Puerperal Sepsis, A New Conception in the Treatment of (Mudaliar and Menon) (O. A.) ..	606	Addison's Disease (L. G. Rowntree) ..	45	Bright's Disease, Studies of— <i>Medicine Monograph</i> , Vol. XVIII (D. D. van Slyke) ..	171
Puri District, Orissa, Observations on Malaria in (Sarathy) (O. A.) ..	254	Alessandra, Magno (M. Bertolotti) ..	715	Cancer: Civilization; Degeneration (J. Cope) ..	532
Purves-Stewart, J. <i>The Diagnosis of Nervous Diseases</i> ..	111	All-India Ophthalmological Society, Vol. II, Session 1931, Proceedings of the ..	591	—A New Theory of and Its Treatment (C. F. Marshall) ..	532
Q		Allergy (G. H. Oriel) ..	649	—and Principles of Treatment, Bendien's Diagnostic Methods for (A. A. Miller) ..	115
Quacks versus Qualified (Bhattacharjee) (C.) ..	417	—Recent Advances on (G. W. Bray) ..	111	—Radium and (H. S. Souttar) ..	289
Quarterly Bulletin of the Health Organisation (M. N.) ..	641	Anæsthesia and Analgesia, Recent Advances in (C. L. Hewer) ..	651	Chemistry, Quantitative Clinical, Vol. II. Methods (J. P. Peters) ..	652
R		—Elementary and Advanced Textbook of (K. E. Madan) ..	50	Chemotherapie, Handbuch der (V. Fischl and other) ..	593
Rabies, The Infectivity of Milk and Meat in (Coelho) (C.) ..	478	Anatomy, Baillière's Synthetic Part XI and Part XII ..	48	Chest Disease in General Practice (P. Ellman) ..	286
—in the Mongoose (Grevall) (O. A.) ..	451	—Baillière's Synthetic. Complete in Parts I—XII ..	408	Climates, Hot, Health in (J. N. Dugdale) ..	173
—The Role of Serology in (Grevall) ..	676	—A Guide to (E. D. Ewart) ..	406	Clinical Diagnosis by Laboratory Methods, 7th edn. (J. C. Todd and other) ..	114
Radium, Ultraviolet Light and X-rays as Therapeutic Agents (C. T.) ..	43	Annual Medical List, 1932, of Registered Medical Practitioners, Published by the Bengal Council of Medical Registration ..	534	—Examination and Surgical Diagnosis (F. Lejars) ..	226
Rahman, M. A. and Mangalik, V. S. A Case of Brodie's Abscess	627	—Medical List, 1932, of Registered Medical Practitioners, Published by the Burma Medical Council ..	534	—and Laboratory Technique, Manual of (H. B. Weiss and other) ..	534
Rai Shambhu Dayal Sahib Gold Medal (M. N.) ..	342	Anopheline Larvæ of the Countries from India and Orient to the Antipodes (Strickland and other) ..	229	Contraception, The Practice of (M. Sanger and other) ..	650
Rajchman, L. Public Health Intelligence of the Health Organisation of the League of Nations ..	539	—Mosquitoes, Illustrated Key to the Full-grown Larvæ and Adults of South African (B. deMeillon) ..	715	Coronary Arteries (Myocarditis) Diseases of the (D. C. Sutton) ..	593
Rajkot, Diphtheria at (Hance) (O. A.) ..	552	Antenatal Talks, Fifty—Advice to the Expectant Mother (G. T. Birdwood) ..	650	Diabetes, The Practical Treatment of (T. I. Bennett) ..	46
Randall, A. <i>Surgical Pathology of Prostatic Obstructions</i> ..	713	Arthritis Rheumatoid and Its Treatment (V. Coates and L. Delicate) ..	170	Diabetic A-B-C: A Practical Book for Patients and Nurses (R. D. Lawrence) ..	650
Rangoon, A Case of Typhus Fever in (Kundu) (H. P.) ..	390	Asthma, The Francis Treatment of (A. Francis) ..	649	Diet, Nutrition and, in Health and Disease (J. S. McLester) ..	46
Rangoon-Mingaladon, Dengue Fever in the (Jafar and Singh) (O. A.) ..	674	—and Hay Fever in Theory and Practice. Parts I, II and III (A. F. Coca and others) ..	405	—Scales, Presidency General Hospital Pharmacopœia and, 1930 ..	173
Rao, B. R. R. Three Cases of Plague, Treated with 'Bayer 205' ..	626	Backache (L. F. Barker and other) ..	228	Digestive Organs, Diseases and Disorders of the (A. Abrahams) ..	592
—D. H. see Dikshit, B. B. Percain in Spinal Anæsthesia ..	69	Bacteriology, General, Textbook of, 10th Edn. (E. O. Jordan) ..	114	Edinburgh F. R. C. S., A Practical Guide to the (M. Keith-Thompson) ..	173
—G. R. and Roy, A. T. Mercurochrome in Leprosy. A Corrigendum ..	417	—Handbook of (J. W. Bigger) ..	535	Embryology, Elements of (Khan) ..	47
—G. R. and Roy, A. T. Mercurochrome-220 Soluble in Leprosy Work ..	124	Bendien's Diagnostic Methods for Cancer and Principles of Treatment (A. A. Miller) ..	115	—A Manual of (J. E. Frazer) ..	115
—K. V. Late Eruption of Wisdom Teeth ..	177	Biochemistry in Internal Medicine (M. Trumper and other) ..	589	Gastro-Intestinal Tract, Functional Disorders of the (W. G. Morgan) ..	287
—R. S. see Pandit, C. G. An Epidemic of Jaundice in the Alipuram Jail, Bellary (South India) ..	77	—of Muscle, The (D. M. Needham) ..	405	Gonorrhœa in the Male and Female (F. S. Pelouze) ..	713
Rat-bite Fever, A case of (Dutt) (H. P.) ..	268	Birth Control and Public Health ..	407	Hæmorrhoids, The Modern Treatment of (J. F. Montague) ..	45
Ray, N. K. A National Drink of the Hillfolk of Darjeeling ..	551	Blood Examinations, The Clinical Interpretation of (R. A. Kilduffe) ..	49	Hay Fever, Asthma and, in Theory and Practice. Parts I, II and III (A. F. Coca and others) ..	405
Rectum, A Case of Congenital Malformation of the, Treated by Colostomy (Das Gupta) (H. P.) ..	520	—The Individuality of the, in Biology and in Clinical and Forensic Medicine (L. Lattes) ..	588	Headache (W. H. Robey) ..	287

	Page		Page		Page
Reviews—contd.		Reviews—contd.		Reviews—contd.	
Helminthological Survey of Southern Rhodesia. Memoir No. 5 (W. K. Blackie) ..	475	Medical Emergencies (C. Newman) ..	170	Neurology, Pediatrics, Medicine: Analytical Reviews of General Medicine. Vol. X, No. 4, 1931 (Williams and Wilkins Co.) ..	348
Histological Technique for Animal and Plant Tissues, Elementary (J. T. Holder) ..	230	Practice, General, A Manual of (W. S. Sykes) ..	111	Pediatrics, Medicine: Analytical Reviews of General Medicine. Vol. XI, Feb., 1932 (I. W. Birkeland) ..	529
Hormonology, Female Sex (W. P. Graves) ..	226	Treatment, Modern (E. Bellingham-Smith and other) ..	44	Nutrition and Diet in Health and Disease (McLester, J. S.) ..	46
Human Body. An Outline of the (A. D. Bellios) ..	116	Medicine: Analytical Reviews of General Medicine, Neurology and Pediatrics. Vol. IX, No. 3, 1930 (Williams & Wilkins Co.) ..	171	and Physical Fitness (L. J. Bogert) ..	228
Hydrotherapy and Physiotherapy (C. E. Calthrop) ..	228	Analytical Reviews of General Medicine, Neurology, Pediatrics. Vol. X, No. 2, 1931 (Williams and Wilkins Co.) ..	47	Obstetrics and Gynecology, Recent Advances in (A. W. Bourne and other) ..	714
Hygiene, An Introduction to (W. Robertson) ..	172	Analytical Reviews of General Medicine, Neurology and Pediatrics. Vol. X, No. 3, 1931 (Williams and Wilkins Co.) ..	48	Ophthalmological Society, All-India, Vol. II, Session 1931, Proceedings of the ..	591
Manual of Village Sanitation and a (C. Bose) ..	408	Analytical Reviews of General Medicine, Neurology and Pediatrics. Vol. X, No. 4 (Williams and Wilkins Co.) ..	348	Ophthalmology, Textbook of (W. S. Duke-Elder) ..	530
Hypnotism, Suggestion and Faith Healing (A. Cannon) ..	715	Analytical Reviews of General Medicine, Neurology and Pediatrics, December issue, 1931, Vol. X, No. 4 (Williams and Wilkins Co.) ..	529	Parasitology, Human, A Guide to (D. B. Blacklock and other) ..	169
Injuries, Accidental: The Medico-Legal Aspects of Workmen's Compensation and Public Liability (H. H. Kessler) ..	49	Essentials of (C. F. Emerson and other) ..	290	Pathology, Human: A Textbook (H. T. Karsner) ..	348
Insects, Indian, Catalogue of—Part 20—Alucitidæ (T. B. Fletcher) ..	173	A Practice of (A. Strumpell) ..	110	Recent Advances in (G. Hadfield and other) ..	651
Indian, Catalogue of, Part 19—Gyrinoidæ (G. Ochs) ..	173	and Science, 1932, A Catalogue of the Publications of ..	347	Phantastica-Narcotic and Stimulating Drugs: Their Use and Abuse (L. Lewin) ..	406
International Clinics. Vol. I, Forty-second Series, 1932 (H. W. Cattell) ..	648	Scottish, History of (J. D. Comrie) ..	715	Pharmacology, A Manual of, and its Application to Therapeutics and Toxicology, 4th Edn. (T. Sollmann) ..	591
Clinics. Vol. III, Forty-first Series, 1931 (H. W. Cattell) ..	648	A Textbook of, by Various Authors (Edited by J. J. Coynbeare) ..	474	Pharmacopœia and Diet Scales, 1930, Presidency General Hospital ..	173
Clinics. Vol. IV (H. W. Cattell) ..	534	Medico-Legal Aspects of Workmen's Compensation and Public Liability: Accidental Injuries (H. H. Kessler) ..	49	Pharmacopœia Indica (K. C. Bose) ..	652
Khadya-Tattva or Principles of Dietetics (B. B. Pal) ..	650	Midwifery, A Handbook of (C. Berkeley) ..	714	Phylaxis (G. Bilard) ..	171
Kidney, Diseases of the (W. G. Ball and other) ..	589	By Ten Teachers ..	225	Physiology, Aids to (H. Dryerre) ..	172
Laboratory Methods, Clinical, A Manual of (C. L. Cummer) ..	290	Mind, Human, The Physical Mechanism of the (A. C. Douglas) ..	714	Human, Manual of (L. Hill) ..	172
Technique, Manual of Clinical and (H. B. Weiss and other) ..	534	Mothercraft: Antenatal and Postnatal (R. C. Jewsbury) ..	650	Physiotherapy, Hydrotherapy and (C. E. Calthrop) ..	228
Lascar Hindustani for Ship Surgeons (S. C. Parry) ..	47	A Manual of (M. I. Balfour) ..	291	Pickett-Thomson Research Laboratory, Annals of the, Vols. I and II ..	229
League of Nations, Publication of Conference on the Limitation of the Manufacture of Narcotic Drugs ..	172	Mycetoma Pedis No Brazil, Do (E. L. F. Araujo) ..	173	Research Laboratory, Vol. VII, Annals of the ..	113
Leeuwenhoek, Antony van and His 'Little Animals' (C. Dobell) ..	709	Narcotic Drugs, Publication of Conference on the Limitation of the Manufacture of (League of Nations) ..	172	Research Laboratory, Monographs of the, Vol. I (E. Browning) ..	114
Legal Medicine and Toxicology (R. W. Webster) ..	228	Nervous Diseases, The Diagnosis of (J. Purves-Stewart) ..	111	Pneumococci and their Enzymes and its Significance in Lobar Pneumonia, Research Work on the (A. C. Guthrie) ..	405
Lightning-Stroke and Its Treatment (H. A. Spencer) ..	407	Neurology, An Introduction to (C. J. Herrick) ..	170	Pneumonia, Lobar, Research Work on the Pneumococci and their Enzymes and its Significance in (A. C. Guthrie) ..	405
Localization of Disease in the Body, Some Factors in the (H. Burrows) ..	593	Pediatrics, Medicine: Analytical Reviews of General Medicine. Vol. IX, No. 3, 1930 (Williams and Wilkins Co.) ..	171	Posture: Its Relation to Health (F. D. Dickson) ..	171
Lungs, The Physical and Radiological Examination of the (J. Crocket) ..	47	Pediatrics, Medicine: Analytical Reviews of General Medicine. Vol. X, No. 2, 1931 (Williams and Wilkins Co.) ..	47	Presidency General Hospital Pharmacopœia and Diet Scales, 1930 ..	173
Malaria Control by Anti-Mosquito Measures (G. Covell) ..	50	Pediatrics, Medicine: Analytical Reviews of General Medicine. Vol. X, No. 3, 1931 (Williams and Wilkins Co.) ..	48	Primeval, Forest, More from the (A. Schweltzer) ..	116
Studies in, as it affects Indian Railways. Part II (Senior-White and other) ..	589	Prognosis and End-Results of Treatment, Index of (A. R. Short) ..	286	Psychiatry, Essentials of (G. W. Henry) ..	115
Manganese Treatment, Thyroid and (H. W. Nott) ..	170	Psychiatry, The Principles of (A. Cannon) ..	651	Psychotherapy, Analytical, An Introduction to (T. A. Ross) ..	651
Marriage, The Hygiene of (I. E. Hutton) ..	408	Its Nature—Its Assumption—Its Limitations: A Search for Essentials ..	530		
Materia Medica of Pharmaceutical Combinations and Specialties (U. B. Narayanrao) ..	592				
Recent Advances in (J. H. Burn) ..	534				
Vegetable, of India and Ceylon (E. Roberts) ..	406				
Medical Annual: A Year Book of Treatment and Practitioner's Index, 1932 (Edited by Coombs) ..	474				

	Page		Page		Page
Urinary Calculi, Notes on (Sabawala) (O. A.) ..	509	W		<i>Williams and Wilkins Co. Published by — Medicine: Analytical Reviews of General Medicine, Neurology and Pediatrics. Vol. X, No. 3, 1931 ..</i>	48
Urine, Entamoeba histolytica in the, A Case with (Cropper and Mitra) (H. P.) ..	387	War, Casualties in (E.) ..	91	Wilson, D. C. A Preliminary Note on the Anti-Rachitic Value of Sun-irradiated Yeast ..	320
Urography with Uroselectan, Intravenous (C. T.) ..	165	Wassermann Results in India, The Interpretation of (Lloyd) (O. A.) ..	1	Wintz, H. Protective Measures Against Dangers Arising from the Use of Radium, Roentgen and Ultra-Violet Rays ..	289
Uroselectan, Urography with, Intravenous (C. T.) ..	165	Wats, R. C. and Jafar, M. Dysentery in Burma (Military Stations) with a Note on Some Post-Dysenteric Infections ..	446	Wisdom Teeth, Late Eruption of (Rao) (C.) ..	177
Uterus, Inversion of the (Das) (O. A.) ..	609	Watson, M. Anti-malarial Measures in Travancore ..	235		
V		Webster, R. W. Legal Medicine and Toxicology ..	228		
Vaccines, The 'Negative Phase' in Prophylaxis by Inoculation of (Stewart) (S. A.) ..	515	W. J. Notes on the Study of Plague in the Field ..	693	X	
van Slyke, D. D. Studies of Bright's Disease. et al. (Medicine Monograph, Vol. XVIII) ..	171	Weiss, H. B. and Isaacs, R. Manual of Clinical and Laboratory Technique ..	534	X-Rays, Ultraviolet Light and Radium as Therapeutic Agents (C. T.) ..	43
Variava, D. D. Avertin Anæsthesia, A Study of 114 Cases ..	548	Welfare Work and the Population Problem (E.) ..	336		
Vesico-Vaginal Fistula and Ectopia Vesicæ: Implantation of the Ureters for Inoperable: A New Technique (Green-Armytage) (S. A.) ..	631	'Widal Reaction and Clot Culture', for the Diagnosis of Enteric Infections, A Routine Combined Method of (Soman) (O. A.) ..	15	Y	
Vibriophages, Cholera and Cholera-like (Pasricha, DeMonte and Gupta) (O. A.) ..	487	Reaction and other Laboratory Findings in Typhoid Fever, The Significance of the (De, Laha, Acharya and Ghose) (O. A.) ..	366	Yaws, Unusual Types of Primary Lesions in (Fitzgerald and Dey) (H. P.) ..	82
Vienna 1932, The 9th Post-graduate Course in Ophthalmology (M. N.) ..	160	William Gibson Research Scholarship (M. N.) ..	641	Yeast, Sun-irradiated, A Preliminary Note on the Anti-rachitic Value of (Wilson) (O. A.) ..	320
Vitamine Value of the Food Fats of Bengal (Brahmachari) (O. A.) ..	377	<i>Williams and Wilkins Co. Published by — Medicine: Analytical Reviews of General Medicine, Neurology and Pediatrics. Vol. IX, No. 3, 1930 ..</i>	171	Yusuf, M. see Hughes, T. A. Changes in Cardiac Rhythm in a Case of Rheumatic Mitral Disease, Complicated with Broncho-Pneumonia ..	568
Volvulus of the Whole of the Small Intestines, A Case of (Dutt Gupta) (H. F.) ..	142	and Wilkins Co. Published by — Medicine: Analytical Reviews of General Medicine, Neurology and Pediatrics Vol. X, No. 2, 1931 ..	47	Z	
Vyas, B. N. and Bhatia, B. B. On the Failure of <i>Toddalia aculeata</i> in the Treatment of Malaria ..	192			Ziehl-Neelsen Method of Staining, Acriflavine as a Counter-Stain in the (Ince) (O. A.) ..	262

Original Articles

THE INTERPRETATION OF WASSERMANN RESULTS IN INDIA

(TWELVE YEARS' EXPERIENCE IN CALCUTTA)

By R. B. LLOYD, M.A., M.B., B.Chir.

LIEUTENANT-COLONEL, I.M.S.

Senior Serologist

THE performance of a Wassermann test demands the following:—

- (1) the preparation of the required reagents,
- (2) the exact titration of these,
- (3) their mixing in the required doses by accurate pipette work,
- (4) the interpretation of the result.

It is with this last and the factors on which it depends that the present article is concerned.

Personal experience.—Probably the most important single factor in Wassermann work is long experience of the particular method employed. Given a technically acceptable method, experienced interpretation in this way reaches a high standard of clinical value. This tremendous advantage is temporarily lost should the experienced worker decide to introduce an entirely new technique. The somewhat conservative attitude of most Wassermann workers is thus not merely explained but abundantly justified.

The sensitiveness of the Wassermann system used.—There are rather wide variations in sensitiveness between the different techniques which have from time to time been employed. The late Professor von Wassermann originally taught that only a complete inhibition of hæmolysis should be regarded as positive in the clinical sense, i.e., equivalent to a diagnosis. It is now quite certain that it is safe to go further than this, and we should now accept as equivalent to a definite diagnosis a complete inhibition of hæmolysis obtained by methods considerably more sensitive than the original technique of Wassermann. It will be recollected that although in this test the diagnosis of a specific disease is reached, the process is usually effected to-day by the use of non-specific antigens, i.e., those prepared from normal organs and not from syphilitic organs, though in the official German Wassermann test at least one antigen prepared from a syphilitic organ is still always included. Progress has been chiefly in the direction of increasing the sensitiveness of the test by various technical alterations. As the techniques become more and more sensitive there is a tendency for false positives to appear. On the other hand if the method be deficient in sensitiveness cases of latent syphilis may be missed. The question as to the sensitiveness to be finally selected must be decided by the circumstances in which the laboratory carries on its work. If the latter is working in very close association with the clinician and if the

result is to be discussed by the clinician and serologist along with the clinical signs, the use of a very sensitive system is justified, since cases of 'latent' syphilis are more likely to be detected while false positives can easily be discounted. If, on the other hand, the serologist has to work blindly, i.e., without any clinical information either before or after the examination, the use of a not too sensitive system is desirable since the essential here is to make sure of one's positives. A not too sensitive system is also required if the tests are to be carried out by comparatively inexperienced workers. It is interesting to recall that during the Great War large numbers of Wassermann tests were apparently done in the German army by persons without special experience of Wassermann work. This produced so many false positives that official action was considered necessary and Professor Wassermann accordingly devised a special technique which was deliberately made insensitive so that it could be used by the ordinary laboratory worker without obtaining false positives. The result of this was that, while the detections of syphilis declined, it was certain that the positives obtained were real positives and represented cases of active syphilis which called urgently for treatment. Instances where the serological and clinical findings in each case can be discussed by clinician and serologist are likely to be exceptional, and on the whole a not too sensitive Wassermann system is to be preferred for general use.

MODE OF READING AND REPORTING RESULTS

In a complement-fixation reaction the basis of the positive reaction is the amount of complement fixed. We have, however, found that the proportion of cells left un hæmolyzed provides a convenient method of reading the result, and experience of this has shown that four grades of reaction which have definite and different clinical meanings may after some practice be distinguished. A method of reporting results has accordingly to be devised, which is applicable to cases where no clinical information has been supplied, which will convey to the clinician in terms which have a definite clinical meaning the experimental result obtained. In a measure the serologist here encroaches on the field of the clinician which should theoretically be avoided. Experience has, however, shown it to be essential, since, except in the case of a fully positive reaction the implication of which is obvious, the clinician is not in a position to judge the value of the weaker degrees of positive reaction since these are dependent on the sensitiveness of the method employed. It is, for example, extremely unwise to report a weak inhibition of hæmolysis as 'weakly positive' or 'slightly positive' unless it is definitely known that the case is under treatment. Such a result has ordinarily in the making of a diagnosis no clinical value.

A report worded in this way may lead to serious trouble, *e.g.*, the inexperienced practitioner may regard it as equivalent to a clinical positive and may give a course of injections. The patient is then in the position of having received treatment for a disease which may not be present. If the treatment were merely unnecessary it would not perhaps matter greatly, but the unfortunate fact is that after a course of injections it is frequently impossible for any person, no matter how expert, to decide whether the patient actually had syphilis or not, a matter of the greatest importance to him in connection with insurance and many other questions.

The Wassermann system used in my laboratory makes use of a 'battery' of three antigens (1) a cholesterinised alcoholic antigen, (2) Bordet's antigen, and (3) cholesterinised Bordet's antigen. It is known that antigen (3) is frequently too sensitive for use where an unknown serum is being examined for a diagnosis, and cases at times occur in which this antigen yields a positive while the other two yield a negative result. Should such a result be obtained the serum would be reported negative if nothing were known about it. Should consultation with the clinician be possible the latter may be asked if it is an early case or a quiescent old case in which a further test one week after a provocative injection of an organic arsenical may be desirable. If it is a developing case of syphilis the Wassermann reaction will be strengthened and the reaction will now very probably be positive with the remaining two antigens. It may here be stated that in the writer's opinion the value of the provocative injection is undoubted, despite suggestions to the contrary that a positive Wassermann reaction may be generated in a non-syphilitic person by such an injection. All the evidence is against this latter view. We thus use the supersensitised antigen as a pointer only without relying on the result, should it be positive. If a negative Wassermann reaction be obtained with this supersensitised antigen the remaining two antigens will also yield a negative result. The obtaining of a negative result with the supersensitised antigen in treated cases indicates that the treatment has been very successful. It will be seen that by the use of a supersensitised antigen in the above manner we utilise its advantages while avoiding its disadvantages.

The grades of reaction.—As noted above, four grades of the experimental result may be distinguished:—

(1) *Complete or practically complete inhibition of hæmolysis.*—Such a result we report as 'strongly positive'. This grade of reaction may be relied on as absolute proof of the presence of syphilis whether the patient has lesions or not, or a syphilitic history or not, subject only to the reservation that yaws and leprosy must first be excluded. We shall return

to this point later. This grade of reaction is typically seen in secondary syphilis, in general paralysis of the insane, and in a large proportion of tertiary lesions. A positive Wassermann reaction means that the patient is suffering from syphilis. It does not mean that the particular lesion for which the patient consulted the surgeon is necessarily syphilitic. This is a matter of outstanding importance and neglect of it may lead to serious consequences. The classical instance is the overlooking of a carcinoma of the tongue, the lesion being considered gummatous in consequence of a positive Wassermann reaction, the sequence of events being that the patient first acquired syphilis in consequence of which syphilitic glossitis developed upon which the carcinoma finally supervened.

(2) *Half positive reactions.*—A grade of inhibition of hæmolysis corresponding to 50 per cent. or approximately 50 per cent. can after some practice easily be recognised. Such results with antigens (1) and (2) are almost always true clinical positives and will usually be supported by the obtaining of a fully positive reaction with antigen (3). Should, however, half positive reactions with antigens (1) and (2) not be supported by a much stronger positive with antigen (3) it is advisable to proceed cautiously. These half positive reactions with antigens (1) and (2) we report as 'moderately positive' and long experience has shown that such a result is a perfectly sound basis for the commencement of a course of treatment, though caution should be observed in basing a diagnosis *solely* on such a result. This grade of positive reaction is typically met with in early cases before the reaction is fully developed, in old visceral syphilis, cardiac, hepatic, etc., in inherited syphilis in adult persons, and in the more quiescent of the tertiary lesions. When correctly interpreted in association with the history and still more with the type of lesion present these half positive Wassermann reactions are of immense value, since they enable the correct treatment to be applied in cases of 'silent' syphilis which could not otherwise be brought to light.

(3) *Low degrees of inhibition of hæmolysis.*—Sera are met with which yield a low degree of inhibition of hæmolysis which is obviously considerably less than the half positive reaction referred to above. If the serum under examination be from a known case of syphilis under treatment it is best to report such results as 'positive weak' or 'slightly positive'. Since a case under treatment must at some period reach the stage at which the Wassermann reaction shows only a weak inhibition of hæmolysis, it is safest to assume that all such results obtained in these circumstances represent a clinical condition, hence the use of the term 'positive', qualified as may seem suitable.

The position is quite different when a low degree of inhibition of hæmolysis is met with

in a serum sent for diagnosis. As noted above, the use of the term 'positive' even when qualified by the term 'slightly' or 'weakly' should here be avoided. Such a result should be reported as 'doubtful' and if the inhibition of hæmolysis is very weak indeed the term 'incomplete negative' is probably the best. The use of these terms means that, while the result of the experiment itself is not in any way doubtful, the serologist is not prepared to say that any laboratory evidence of syphilitic infection has been obtained. A large proportion of these weak inhibitions of hæmolysis are probably without diagnostic value, though at times they may be sufficiently strengthened by a provocative injection to become, in association with the clinical syndrome, of real use to the clinician in the investigation of obscure cases, *e.g.*, nervous breakdowns in late middle life where the syphilitic infection if present is perhaps of thirty or more years standing.

(4) *Negative reactions.*—Where the hæmolysis is complete the Wassermann reaction is necessarily reported as 'negative'. The implication of such a result varies a good deal with circumstances, the chief of which is the sensitiveness of the system used. Every serologist who does much Wassermann work should be constantly on the watch to prevent his system becoming too insensitive. To this end he should periodically examine (a) the highest dilution of the serum from a case of secondary syphilis which will yield a fully positive Wassermann reaction, (b) the results of the Wassermann reaction in very old and fairly quiescent lesions which are obviously syphilitic, *e.g.*, old gummata, perforations of palate, etc., (c) the results should from time to time be compared with those of the Kahn test. This is in the writer's view the most useful application of Kahn's test, *i.e.*, its use to prevent variations of sensitiveness of the Wassermann system of any one laboratory and to compare the sensitiveness of different Wassermann systems in different laboratories.

In the hands of a serologist who carefully observes the above precautions the value of a negative Wassermann reaction in excluding syphilis is considerable. It becomes greater if, as in our method, a supersensitised antigen is used. It becomes greater still if it remains negative on repeated examination; and, when the clinical condition is a skin lesion which if syphilitic would be secondary, a negative Wassermann reaction completely excludes a diagnosis of syphilis. The same may be said of clinical diagnoses of general paralysis and inherited syphilis in infants of a few months old, both of which diagnoses may be absolutely ruled out if the Wassermann reaction is negative. The statement as regards infants is restricted to those who are a few months old, since the Wassermann reaction of a syphilitic infant at birth may be negative, at any rate as performed on the umbilical cord blood. The

exact implication of umbilical cord blood Wassermann tests is open to some doubt and will not be discussed here.

The above three conditions are the only stages of syphilis in which the Wassermann reaction may be guaranteed to yield a positive reaction in 100 per cent. of cases. The Wassermann reaction frequently does not become positive under six weeks from the date of infection. A negative reaction obtained during this period is consequently without value in diagnosis. A large proportion of tertiary lesions will yield a positive reaction, though it is difficult to express this proportion in a percentage, since much depends on the activity of the lesion and the sensitiveness of the method employed. The clinician must not, however, rule out a diagnosis of syphilis on a negative Wassermann reaction in the presence of a lesion which, if syphilitic, is a late tertiary, since such lesions may undoubtedly coexist with a negative Wassermann reaction.

THE WASSERMANN REACTION IN ADULTS SUFFERING FROM INHERITED SYPHILIS

Adult persons suffering from inherited syphilis, many of whom may appear to be strong and healthy and show no stigmata, are not immune from sexual temptation though they may possibly be immune from acquired syphilis. Such an individual after exposure to infection may subsequently through fear of the consequences consult a doctor. The latter, finding no signs of the acquired disease, will probably doubt the accuracy of the Wassermann result which is frequently in such cases half positive owing to the inherited taint. The accuracy of the Wassermann result is appreciated later by the clinician on his discovery of its extraordinary obstinacy to treatment. This obstinacy of the positive Wassermann reaction to treatment is very characteristic of inherited syphilis. The infection having been acquired *in utero*, is in the case of an adult, necessarily of old standing. We have had several cases presenting the above features, which, until correctly interpreted, are very confusing.

WASSERMANN-FAST CASES

In contrast to the condition previously discussed, *viz.*, an old tertiary lesion with a negative Wassermann reaction we may find what appears to be the reverse, *viz.*, a positive Wassermann reaction without lesions. These are the so-called 'Wassermann-fast' cases. They are usually, though not invariably, cases which have been neglected in the early stages. There is a minority of patients which in spite of skilled handling fails to react properly to treatment. It is this which necessitates a cautious prognosis in the individual case. If the Wassermann reaction is still positive at the end of the first year the outlook is not particularly favourable, and great efforts especially by means of a change of treatment should be

made to prevent the patient from drifting into the Wassermann-fast condition in which the prognosis is always grave. Wassermann-fast patients usually die prematurely and post-mortem examination practically always reveals grave visceral damage of which aortitis and its consequences are the most important. The apparent absence of lesions is therefore very deceptive. The term 'Wassermann-fast' is to some extent a misnomer for it is known that well-judged treatment will in most cases reduce the strength of the positive Wassermann reaction, even if it cannot extinguish it, and treatment should always be applied except perhaps in very old persons in whom the results obtained are not likely to be commensurate with the trouble involved.

THE WASSERMANN REACTION IN PREGNANCY

By the use of a properly adjusted Wassermann system the reaction is invariably negative during all stages of pregnancy provided syphilis be absent. Routine Wassermann tests are important here since in pregnancy syphilis tends to assume a latent form, and the future of the unborn child may depend upon the Wassermann test.

THE WASSERMANN REACTION IN NON-SYPHILITIC DISEASES

(a) Malaria

Positive Wassermann reactions have been reported by certain workers as occurring during the febrile stages of malaria. This is a very important matter in the tropics and exact information on the point is necessary. It has been very thoroughly investigated by many workers in different parts of the world. The present writer with Mitra has examined the question in Calcutta (1926). It may be said at once that the occurrence of positive reactions in malaria is partly a question of technique and partly a question of concomitant syphilis. Mixed infections are a commonplace of tropical medicine. The case for routine Wassermann tests rests on this, since if the patient shows typical signs of another disease there is great risk that coexisting syphilis may be overlooked. The reports of several workers to the effect that a positive Wassermann reaction may occur in malaria show that the precautions taken to exclude associated syphilis were entirely inadequate. Aside from this, it is only with very sensitive techniques that a positive reaction will be obtained in malaria, and even then the reaction is weak and would not in experienced hands lead to a diagnosis of syphilis. Every worker in the tropics must, however, so adjust his technique that malaria in the febrile stages uncomplicated with syphilis will invariably yield a negative reaction. This is an absolutely essential feature of any Wassermann technique to be used in the tropics. Among many important observations on this question we may mention the outstanding one of Iyengar (1920)

who found, using a standard Wassermann technique, that quinine has no influence on any positive Wassermann reaction met with in malaria. Since it is only in the febrile stages that positive reactions have been reported the import of this is obvious.

A Wassermann system must be highly supersensitised before any false positives due to malaria appear, and in our own laboratory we find no positive reactions in malaria even with the supersensitised antigen which is always included in our 'battery', other than those which are attributable to associated syphilis acquired or inherited.

(b) Yaws

The Wassermann reaction is ordinarily positive in generalised yaws, though not necessarily where localised lesions alone are present. This positive reaction is a 'true' positive, i.e., it cannot be excluded by any modification of technique which will demonstrate the positive reaction in syphilis. Yaws is not a common disease in most parts of India, but it is important to appreciate the fact that Wassermann surveys to estimate the prevalence of syphilis in the population are of no value in areas where yaws is endemic. The immunological connection between yaws and syphilis is an interesting question which does not fall within the scope of this paper.

(c) Leprosy

The question of the Wassermann reaction in leprosy is more difficult. A prolonged series of observations by Muir, Mitra and the present writer (1923), (1924), (1927) seemed to show that syphilis was the basis of many of these reactions, even in the later manifestations of the skin types in which positive Wassermann reactions are very frequent and also very strong. It appears, however, that, apart from positive fixations caused by associated syphilis, leprosy sera have a very considerable tendency to yield 'false' positives which can only be overcome by radical alterations of technique.

It would seem therefore that the position in leprosy is similar to that in malaria, i.e., that the positive fixations are partly due to associated syphilis and partly due to technique. There is, however, the enormous practical difference between the two that it is quite simple to make the necessary adjustments in technique which will exclude all reactions due to malaria while leaving an extremely serviceable instrument for the detection of syphilis in all its stages. On the other hand the exclusion of positive reactions due to leprosy involves radical alterations of technique. It appears that the factor leading to non-specific positive reactions is quite weak in malaria, whereas it seems to be strong in leprosy.

(d) Relapsing fever and typhus fever

Positive Wassermann reactions have been reported in both these conditions. The writer

has had no opportunity of examining the Wassermann reaction in these two diseases and the matter will therefore not be discussed here. Serum would not ordinarily be sent for the diagnosis of syphilis during an attack of these diseases.

The above remarks on the meaning of the Wassermann reaction in the various stages of syphilis are therefore subject to the reservation that yaws and leprosy can be excluded.

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INDIAN CHENOPODIUM

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Introductory

CHENOPODIUM (American wormseed) is one of the most widely-used anthelmintics at the present time. It was used by the American Indians in the days of Columbus, and in South America infusions made from leaves and seeds have been used as a household remedy against intestinal parasites for a long time. Baumler and Fribourg introduced the drug into Europe in 1881 for the treatment of hookworm disease, but their results were not encouraging. The oil was originally used as a remedy against ascarides but was not popular on account of the toxic and sometimes fatal effects produced in some cases. Schüffner and Verwoerd (1913) tried it against hookworm in Sumatra in 3 c.cm. doses with castor oil and chloroform, and obtained results superior to those obtained with thymol, beta naphthol, etc. From this time on, the drug came rapidly into use and received further impetus during the Great War when the supply of anthelmintic remedies such as santonin and thymol decreased. It was extensively tried by various workers and proved a very valuable anthelmintic against many forms of intestinal parasites.

Oil of chenopodium is obtained principally from *Chenopodium ambrosioides* var. *anthelminticum* or American wormseed, commonly known as 'Jerusalem oak' or 'Mexican tea'. It is an annual or perennial herb belonging to the Chenopodiaceae or goose-foot family. It is a native of Central America and the West

Indies but grows wild in many parts of the United States from New England to Florida and California. The plant flowers from July to September and the fruits ripen in the autumn. The oil is distilled from the seeds and the half-dried, aerial parts of *C. ambrosioides*. At one time the fruit was official in the U. S. Pharmacopoeia but it has been discarded. The fruit from which the oil is expressed is somewhat globular, frequently more or less compressed, with a thin greyish-brown pericarp. The seeds are reddish, brown or black, kidney-shaped and shiny, and have a strong eucalyptus-like aromatic odour and a bitter and pungent taste. A large trade in chenopodium seeds existed in America for a long time. Nowadays chenopodium seeds are very seldom exported as the oil is distilled on a large scale in Baltimore (Baltimore oil) and in Illinois (western oil).

The active principle of chenopodium is a volatile oil which, like most of the substances of this class, is a mixture of various constituents. The oil has no definite boiling point and when it is heated to 100°C. in the air, it explodes with great violence. Different specimens of the oil differ much in their physical characters; the colour may vary from pale yellow to bright golden yellow. The toxicity of different stocks also varies considerably. The anthelmintic properties of the oil are due to the presence of a chemical compound *ascaridole*, $C_{10}H_{16}O_2$, which occurs to the extent of 40 to 70 per cent. in various samples.

Other sources of chenopodium

Though chenopodium is indigenous to Central America, it is also found growing in a state of nature in the East Indies and in India. In the Philippines as many as 50 species grow but only two varieties have so far yielded oil of medicinal value. In Sumatra and several other places in the Dutch East Indies, chenopodium has been seen. In India 6 or 7 species are known to occur. It is interesting to note that chenopodium can also be cultivated in areas where it is not indigenous with satisfactory results. This has been done on a large scale near Weston in America where a belt of land 15 miles long and 4 miles broad is under cultivation with an average annual production of 10,000 to 40,000 lbs. per 20 acres. At Deli in Sumatra and in Java the plant is grown successfully and the oil is also distilled but it differs slightly in composition from the standard American oil.

Indian varieties.—*Chenopodium ambrosioides* is common in many parts of Bengal, Sylhet, the Deccan, Coimbatore, etc., *Chenopodium botrys* is found in the temperate Himalayas from Kashmir to Sikkim at altitudes from 4,000 to 10,000 feet. Several other varieties, e.g., *C. blitum*, *C. album* (known in Bengal as 'Bathu-sag') which grows both in the hills and in the plains, are available plentifully, near Calcutta. All these varieties of chenopodium,

however, do not yield the therapeutically-active oil. In view of the importance of the drug, experimental cultivation was started at Mungpoo in the Darjeeling district and also in the Bangalore gardens in Mysore State. It was recommended in the report of the Director of the Botanical Survey of India some years ago that the seeds should be sown thinly in a seed-bed in March and transplanted 18 inches apart in all directions. *C. ambrosioides* which was planted grew to a gigantic size at Mungpoo and seeded well, but the seeds yielded only 0.48 per cent. of oil in contradistinction to the expected yield of 3 per cent. For several reasons the cultivation of this variety has not proved to be a commercial success in Bengal and has been discontinued.

The Indian and American oil

The Indian chenopodium oil, both from *C. ambrosioides* and *C. anthelmintica* was examined by Henry and Paget at the Wellcome Bureau of Scientific Research. The yield of the oil according to their estimation was lower.

Percentage of oil yield—

C. ambrosioides—0.17.

C. anthelmintica—0.24.

The oil expressed from the Indian seeds was found to be lighter in colour, and had an odour somewhat different from that of the American wormseed oil derived from *C. ambrosioides* var. *anthelmintica*.

The constants of the Indian oil as compared with those of American wormseed oil are as follows:—

Nature of oil.	Sp. Gr. at 15°C.	Sp. rotation.
<i>C. ambrosioides</i> (Indian)	0.9399	+0.07°
<i>C. anthelmintica</i> "	0.9080	—9.6°
American wormseed oil	0.9669	—5.6°

From the results of the fractional distillation, the composition of the mixed Indian oil, as compared with that of American wormseed oil, is approximately as follows:—

	Mixed Indian oil	American wormseed oil
	Per cent.	Per cent.
Hydrocarbons (including L-terpinene and P-cymene)	45-50	30-40
Lævo Terpinene	nil	5
P-cymene	25	15
Chenopodium terpene	—	10
Ascaridole	46	65
Residue	4	5

It will be seen from the above that Indian chenopodium differs from good American chenopodium oil in containing less of the active principle, ascaridole, viz, about 46 per cent. in place of 65 per cent. or more. Another difference lies in the nature of the hydrocarbons present. The American oil contains about 30

per cent. of this fraction of which about half is cymene and the other half a mixture of terpinene and a lævo-rotatory terpene. The hydrocarbon fraction of the Indian oil on the contrary is p-cymene with a small amount of dextro-rotatory terpene. The specifications of the United States Pharmacopœia are that the oil shall have a specific gravity of 0.955 to 0.980 at 25°C., shall be soluble in 8 volumes of 70 per cent. alcohol and shall have an optical rotation between —40° and —10° in a 100 mm. tube at 25°C. The mixed Indian oil, therefore, obviously falls short of these specifications.

Economic aspects

In view of the differences between the two specimens of oil as outlined above, the Indian oil may be considered to be very much inferior. The clinical results achieved so far with the Indian oil are, however, said to have been satisfactory. It is said to have been tried with encouraging results in hookworm disease and roundworm infestations. It will, therefore, be worth while to investigate its further possibilities. Experiments carried out in America definitely show that it is possible to improve the quality of the oil by intensive cultivation. Poor cultivation without proper attention towards sowing and without the liberal use of fertilisers results in a small yield. These details could be easily attended to in India. Further, in the light of work carried out by W. A. Konantz, Chief of the Research Department, Quincy, Illinois, it seems probable that the quality and yield of oil are largely due to faulty methods of distillation. Nelson has laid stress on the method of distillation, stating that the chief active ingredient was unstable and was decomposed gradually on boiling with water. Consequently he suggested that the distillation should be carried on rapidly with steam at a higher pressure, the condenser kept warm and the warm distillation water separating from the oil in the receiver discarded. Russell stated that 'the method of distillation is a factor which causes great change in the oils' and that 'with rapid distillation, that is with a good flow of steam, an oil was secured which passed all the requirements of the United States Pharmacopœia and contained a high percentage of ascaridole'. He observed that no difference in yield and specific gravity of the oil occurred when the steam pressure at the distilling retort was 80 to 100 pounds. When the pressure was reduced to 40 to 60 pounds the specific gravity was lowered. The time of distillation (from the appearance of distillate at the discharge end of condenser) was 8 to 10 minutes; with a slower method of distillation, the specific gravity was reduced. A more careful distillation, therefore, with proper attention to these points is likely to improve the quality of the oil. Though chenopodium has lost much of its ground since the discovery of the anthelmintic properties of carbon tetrachloride by

M. Hall in 1921 it is still in great demand. Not only is it used as the alternative or substitute for carbon tetrachloride but is now frequently used in combination with it. Soper (1924) called attention to the fact that the proportions of the two drugs should depend on the nature of the worms harboured. Carbon tetrachloride alone is said to be more effective against pure necator infection and chenopodium for ascaris infection, whereas ankylostoma infections are apparently most readily cured by a combination of the two, with a relatively high proportion of chenopodium. As in India a mixed parasitic infection is the rule rather than the exception, the demand for chenopodium will always remain. In view of the simplicity of administration and the extreme cheapness of carbon tetrachloride (Rs. 2-8-0 per pound) as compared with the oil of chenopodium (Rs. 32 per pound) it may not be possible to use it on an extensive scale for mass treatment as was being done at one time under the auspices of the International Health Board of the Rockefeller Foundation. It should however be remembered that the dose of chenopodium oil when given in combination with carbon tetrachloride is comparatively much smaller (1.0 c.cm.) than when given by itself (3.0 c.cm.). Maplestone and Mukerji (1931) have obtained much better results in the treatment of ascaris infections with a combination of santonin 5 grains and chenopodium oil 1.0 c.cm. in a capsule. In view of these facts there will be sufficient demand to justify the cultivation and production of the oil in India. Apart from its medical use, it is employed largely in veterinary practice in the eradication of intestinal parasites of domestic animals and agricultural cattle. As it is a herb which will probably grow quite well in the plains of India, it would be worth while trying its cultivation in Bengal and some of the neighbouring provinces. Many years ago chenopodium was for some time experimentally grown by a botanist near Port Canning in the 24-Parganas. It has also been grown experimentally in the Benares Hindu University Botanical Garden. Because chenopodium cultivation has been discontinued by the Government Cinchona Plantation authorities at Mungpoo, there is no reason why it should not be given a trial under more favourable conditions. The results of cultivation of chenopodium in Java, though not encouraging at the beginning, have been very satisfactory as will be seen from a study of the properties of the oil distilled from the seeds there.

Constants of chenopodium oil distilled in Java

Specific gravity	..	0.9662
Specific rotation	..	1.4786
Acid value	..	0.9
Ester value	..	9.8

Soluble in 5.8 volumes and more of 70 per cent. alcohol.

This approaches the standard American oil very closely, and it has been used in Java in place of the American oil. This fact should encourage those interested in the cultivation of the drug in India.

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ALEPOL IN LEPROSY

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CHAULMOOGRA oil has been known to be a drug exerting a beneficial action in leprosy for a very long time in India, but as the drug could not be given in sufficiently large doses the treatment was not very successful. In 1914 Heiser gave the oil by injection, and his work was followed by that of Rogers who in 1915 began his attempts to find out the active constituents of the oil. In 1916 Rogers demonstrated that sodium gynocardate was effective by intramuscular and intravenous injection, and later showed that the soaps of hydnocarpic acid were the most active of all the soaps. These soaps have, however, got a drawback because of their irritant nature and recently Rogers overcame this when T. A. Henry prepared for him a sodium salt of selected lower-melting-point fatty acids from *Hydnocarpus wightiana*. This has been now extensively used under the name 'Alepol'. In a previous communication (Dikshit and Row, 1931) the clinical findings in nine cases of leprosy treated with Alepol were reported from this department. We have been using Alepol in a large number of patients since then and the following is a summary of the results obtained.

The line of treatment is exactly the same as that advocated by Dr. E. Muir (1927) of the Calcutta School of Tropical Medicine, the only difference being that we are using Alepol instead of the oil or ethyl-esters. The subject of the pharmacology of Alepol has been dealt with in a separate paper published elsewhere (1932). In brief it is a sodium salt of the less irritating lower-melting-point fatty acids of hydnocarpus oil, having a slightly depressant action on the

cardio-vascular system, a stimulant action on the respiratory system and little or no important action on other systems of the body. It is less irritating locally than other salts of hydnocarpus oil and it has a marked hæmolytic action. This latter effect, however, can be diminished by dissolving the drug in Locke's solution instead of in distilled water.

Treatment

As has been pointed out before, the line of treatment was the same as advocated by Dr. E. Muir (1930). Predisposing causes like syphilis, malaria and hookworm were treated by appropriate methods. Factors which increase the general resistance of the patient were paid attention to. A majority of our patients were out-patients, and they were given instructions about diet and exercise, etc. The reaction level if too low was increased by giving alkalies by the mouth or intravenous injections of potassium antimony tartrate in small doses. Nerve reactions were treated with oral administration of ephedrine. Alepol was the only leprosy drug used. Potassium iodide was not given to a vast majority of the patients. The dose of Alepol was determined by the sedimentation index. Local treatment consisted of application of trichloroacetic acid in strengths varying between 1 in 2 and 1 in 3.

For intramuscular injections Alepol was dissolved in freshly-distilled water and sterilized by boiling. The strength for intramuscular injections was 3 per cent. We did not add carbolic acid to the solutions to maintain asepsis. The solutions were prepared just before the injections and were sterilized immediately before use. For intravenous injections we use the following formula:—

Alepol	..	..	1.0 gm.
NaCl	..	..	0.9 gm.
KCl	..	..	0.04 gm.
CaCl ₂	..	..	0.02 gm.
NaHCO ₃	..	..	0.01 gm.
Dist. water	..	to	100.0 c.cm.

(Alepol in Locke's solution without the addition of glucose.) The strength of Alepol in this solution is 1 per cent. When necessary, 2 per cent. strengths are prepared by dissolving double the quantity of Alepol. Carbolic acid is omitted from this solution also.

Injections are given intramuscularly or intravenously. In the latter case Muir's expedient of withdrawing blood into the syringe containing the dose and injecting a mixture of the blood and solution in the vein is employed. It has been shown in a previous communication (Dikshit and Row, 1931) that this procedure not only lessens the local action on the vessel endothelium but reduces the hæmolytic action as well.

In the case of intramuscular injections, a formula similar to the one given above may be used with advantage. Alepol injections are

less painful than those of other soaps of hydnocarpus oil, and if the solutions are prepared according to the formula given the incidence of pain will be considerably less.

The dose is regulated according to the condition of the individual patient. We generally begin with 1.0 c.cm. of a 3 per cent. solution intramuscularly. Injections are given twice a week, and the dose is increased by 0.5 c.cm. every time till a maximum of 5.0 c.cm. is reached. This dose can safely be exceeded, but the bulk of the solution may prove troublesome to the patient. We therefore begin the next injection with 1.0 c.cm. of a 1 per cent. solution intravenously and gradually work up to 5.0 c.cm. When this limit is reached we double the strength of Alepol and start with 1.0 c.cm. of a 2 per cent. solution of Alepol, gradually rising up to 5.0 c.cm. and when conditions are favourable up to 9 or 10 c.cm. In a number of cases, however, this course may have to be interrupted because of certain symptoms like fever or flaring up of skin lesions. The ordinary course is determined by the sedimentation index. If the index is low enough, indicating a high level of resistance, the dose can be increased as given above. In other cases it will have to be adjusted according to the needs of the patient. Injections of Alepol increase the sedimentation index immediately after the injection and it comes to the original level after some time. The return of the index to the original level is also a good indication to adjust the dose. The sedimentation index is taken just before the injection and twenty-four hours after the injection, and the difference between the two figures gives an idea whether the dose was too large or not and whether the next dose should be increased or decreased or should be the same. The following graphs represent curves of sedimentation index before and twenty-four hours after injections of Alepol. All these patients have been under treatment for a varying length of time. Wednesday 14th October was the day of injection. At 9 a.m. their blood was taken for determination of the sedimentation index and different doses of Alepol were given to these patients intravenously after the blood was taken. The patients were asked to come the next day again, and at 9 a.m. on the 15th, blood was taken for determination of the sedimentation index. The curves show the different rates of sedimentation of erythrocytes in the various patients, and a reading taken at the level of 2 hours will represent approximately the sedimentation index of the patient. The vertical line in the curves of the same patient shows the difference between the two readings taken at an interval of twenty-four hours. If the difference is less than 10 the dose given was not too large. If it is more, the dose should be reduced. If the difference is about 5 or 6 only the dose can be increased. In actual practice it is not necessary to plot the curves. The difference between

the readings of the sedimentation index of the same patient on two days gives an idea whether the dose was too large or not. The index is taken by taking a mean of the readings at $1\frac{1}{2}$ and $2\frac{1}{2}$ hours.

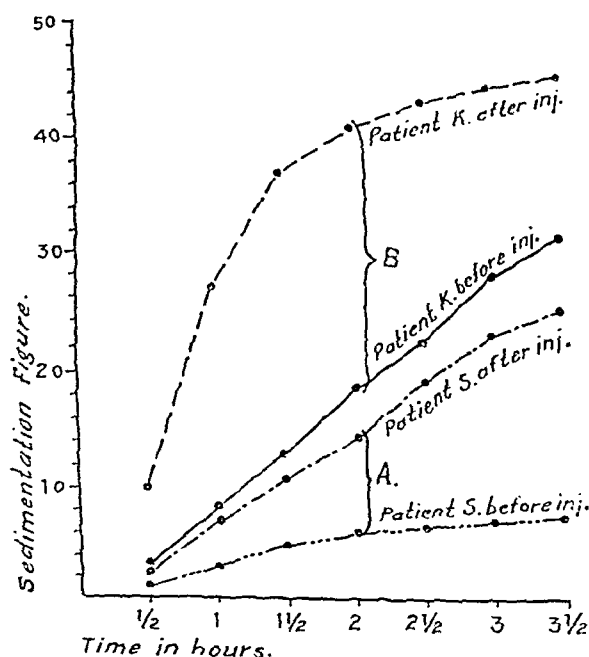
It will be seen from the graph below (I) that the recovery of the sedimentation index of the patient S. is fairly rapid. This patient belongs to B_2 type and was given 4.0 c.cm. of a 2 per cent. solution of Alepol intravenously. The difference in the sedimentation index before

GRAPH I.

Shows the rate of sedimentation of erythrocytes of two patients before and after Alepol injections.

Lower two curves from patient S.;
 Before Injection. (dashed line)
 After Injection. (solid line)
 Upper two curves from patient K.;
 After Injection. (dashed line)
 Before Injection. (solid line)

Both patients were given 4 c.cm. of 2 per cent. solution intravenously. Brackets A and B show the difference after Alepol injection, in the sedimentation index of the same patient.



and twenty-four hours after the injection is less than 10. The initial level of the index also is low for a patient of his type. The dose in this case was therefore not excessive and at the next injection the dose can safely be increased to 4.5 c.cm. In the case of patient K, who belongs to the A_2B_2 type, the difference was more than twenty. In this case therefore,

although the initial level of the index was fairly good for a patient of his type, the dose of 4.0 c.cm. of a 2 per cent. solution was too large. The next dose for the patient should therefore be reduced.

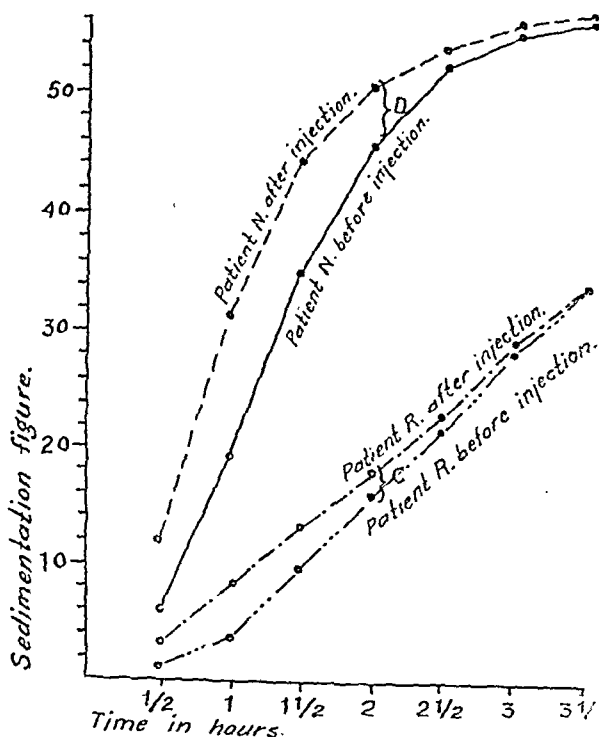
Graph II shows the sedimentation index curves of two patients R. and N., before and after an injection of Alepol. The lower two curves show the rate of sedimentation of erythrocytes of the patient R. This patient belongs to the A type and has taken treatment

GRAPH II.

Similar to graph I. Both patients were given 2.0 c.cm. of 1 per cent. solution of Alepol intravenously.

Lower two curves from patient R.;
 Before Injection. (dashed line)
 After Injection. (solid line)
 Upper two curves from patient N.;
 Before Injection. (dashed line)
 After Injection. (solid line)

Brackets C and D represent the difference between two readings of the sedimentation index of the same patient.



for a short time only. He was given 2.0 c.cm. of a 1 per cent. solution intravenously. His initial level of the index is somewhat high for a patient of his type but it will be seen from the curves that the difference between the figures before and after the injection is very small. In this case therefore the dose can be increased. The other patient N. belongs to the B_2 type and his initial level of the sedimentation index is very high. He was given 2.0 c.cm. of a 1 per cent. solution of Alepol intravenously. The

* Presumably Dr. Muir's classification; the reader is referred to the footnote on page 12 of this issue.—
 Error, I. M. G.

difference between the two curves is not marked, but as the initial level of the index is very high the dose will have to be increased with caution. The doses therefore are regulated according to the type of the patient, his initial level of the index, and the rapidity with which the increased index returns to the original level.

A patient who tolerates his injections well and attends the clinic regularly reaches the maximum dose of 5.0 c.cm. of a 2 per cent. solution intravenously by the middle of the third month. He will have taken by this time about 30 injections and approximately 1.6 gm. of Alepol. If he continues to take the same dose (5.0 c.cm. of 2 per cent. solution) throughout the rest of his period of treatment he will have to take 70 more injections to complete a course of treatment for one year. A patient who attends regularly, therefore, takes about 100 injections in one year and the total quantity of Alepol required for these injections is about 8.6 gm.

The cost of treatment of leprosy with Alepol is small. A patient requires on an average 8.5 gm. of Alepol for a course of treatment for one year. A 25 gm. bottle of Alepol (Burroughs Wellcome & Co.) costs about Rs. 5. Three patients therefore can be treated with Alepol for one year for 5 rupees. The cost of treatment per patient per year is less than two rupees.

It has been already pointed out that we have not used potassium iodide to any appreciable extent. In none of the cases which are mentioned hereafter was potassium iodide used. Alepol was the only lepromolyte used in these cases.

Results

We have treated 200 cases of leprosy with Alepol during the last fifteen months. Out of these 112 were of the nerve type, 43 of the skin type, while 45 belonged to the mixed variety. It was interesting to note that a number of early nerve cases belonging to the A₁ group came for treatment to the hospital voluntarily. Results obtained in these cases were uniformly good. The fairly high percentage of 'symptom-free' results that we obtained in our A cases was due to the large proportion of these early nerve cases with less than three months history of the disease.

About 3,600 injections have been given during the last fifteen months. The average number of injections per patient was 18 and the average duration of treatment 2½ months. The majority of the patients were out-patients and only a limited number were admitted into the ward. The attendance at the out-patients was not very regular but in a majority of cases the attendance was satisfactory. That these Alepol injections were 'enjoyed' by the patients is shown by the fact that the daily attendance at the out-patient clinic was higher than the daily attendance recorded last year when Alepol was not used.

In A₁ cases with depigmented anaesthetic patches the sensations returned on an average after about 3½ months treatment, the earliest being observed after about 2 months treatment. This return of sensations was seen in about 60 per cent. of cases. In a vast majority of the remaining cases the lesions were stationary, only three out of the 112 cases becoming progressively worse. All these three cases later on showed skin lesions after having taken 8 months continuous treatment. In A₂ cases perforating ulcers healed rapidly. No fresh lesions appeared in any case. Improvement in other trophic lesions was naturally not marked.

In the mixed group some patients showed very good recovery, especially those who fall under A₁B₁ group. Those who showed this result took on an average 8 months treatment. Their skin lesions markedly improved in appearance and became bacteriologically negative. The general health improved and the sedimentation index, which was in some cases as high as 40, came to 8, and remained persistently low, varying between 5 and 10. All these cases which showed this improvement are still under treatment and their sedimentation index is always below 10. In the late mixed cases the improvement was not marked but was very gradual and slow. None of the cases belonging to this group became worse.

Lesions belonging to the skin type showed very varying results. B₁ cases showed much better improvement than B₂ or B₃ cases. Nasal smears became negative in those in whom they were positive before treatment. Most of the cases under treatment were stationary. In a small proportion of cases of the B₃ type definite improvement was seen. Out of 43 cases belonging to the B type 4 became progressively worse. Their sedimentation index remained persistently above 45 in spite of all efforts to lower it. They could not tolerate a dose of 5.0 c.cm. of 1 per cent. solution.

Age.—The youngest patient in our series was a female child 2½ years old with an A₁ lesion on the cheek. The oldest was a man of 65 belonging to the mixed type. The incidence of the disease in the various decades of life is shown in the following table:—

TABLE I
Showing the incidence of leprosy in the various decades of life

Age group	Incidence
0—10	28
10—20	16
20—30	34
30—40	64
40—50	39
50—60	16
60—70	3
TOTAL	200

It will be seen from the above table that about 70 per cent. of cases were affected before the age of 40 and if we allow a certain margin for the incubation period, more than 70 per cent. are infected in the first four decades of life. The incidence of the disease in the early years of life is high. Fourteen per cent. of the cases were affected before the age of 10. Only 3 out of the 28 cases were children below 5. So the incidence of the disease between the ages of 5 and 10 is very high. In a majority of these cases there was a history of leprosy in the family and in some cases the child and the parent were attending the out-patient clinic together.

Wassermann reaction.—This was carried out in a small proportion of cases: 72 samples of blood were examined for the Wassermann reaction. Out of 72, 50 showed a positive and 22 a negative reaction. The percentage of positive reactions in our series was therefore very high, about 70 per cent. The reaction however was done in a selected number of cases and this may be the reason for the high percentage. Out of the 50 positive cases, 26 had a strongly positive reaction, 10 a moderately positive, and 14 a weakly positive reaction. The 72 cases contained 38 of the nerve type, 14 of the skin type and 20 of the mixed type. The following table gives the details about the Wassermann reaction:—

TABLE II

Showing the number of strong, moderate and weak Wassermann reactions in the different types of leprosy

Type	+++	++	+	—	Total
A	13	5	7	13	38
AB	5	3	6	6	20
B	8	2	1	3	14
TOTAL	26	10	14	22	72

+++ Strongly positive. A, Nerve type.
 ++ Moderately positive. B, Skin type.
 + Weakly positive. AB, Mixed type.
 — Negative.

It will be seen from the table given above that about one-third of the A cases and one-fourth of the mixed type show a strongly positive reaction, while more than half the cases belonging to the B type show the reaction strongly positive.

Discussion

It will be seen from the observations given above that Alepol has a distinct advantage over the other salts of hydnocarpus oil in being less irritant in its local action. It is very difficult to say whether it is superior to hydnocarpus

oil, or its other salts or ethyl-esters, from the clinical results, the results obtained being almost the same. It appears however that the changes seen in cases belonging to the A₁ type are more rapid in the case of Alepol. In other types of cases there appears to be no appreciable difference. Some B₂ cases appear to improve better under hydnocarpus oil alone, while others of this type show better results with Alepol. There were some patients in our series who did not tolerate 3.0 c.cm. of hydnocarpus oil but tolerated 5.0 c.cm. of a 3 per cent. solution of Alepol intramuscularly very well, while other cases which showed very little change with Alepol injections showed a change for the better with pure oil. If saturation of the system with the remedy, consistent with the resistance of the patient, is aimed at, the aim can be attained better with Alepol than with other salts of the hydnocarpus oil or the oil itself. The toxic dose of Alepol is very high and the most important deleterious action that the drug can exert is the hæmolytic action on the red blood corpuscles. This hæmolytic action can be considerably reduced, as has been pointed out, by preparing the solution for injection in the formula given and by adopting Muir's expedient for intravenous injections. In animal experiments it has been found that a dose smaller than the lethal dose produces considerable respiratory distress and patches of hæmorrhage are seen in the different parts of the body. Therapeutic doses in human beings are far smaller than the toxic doses and dangerous doses are never approached, even if the doses given in this paper are considerably exceeded. The chief danger in excessive doses is the lowering of the vitality of the patient which gives an opportunity for the *M. lepræ* to spread more. A dose based on the sedimentation index of the patient is safe and the maximum dose of 10.0 c.cm. of a 2 per cent. solution intravenously need not be exceeded. This dose is tolerated only by a few patients and in most of the cases a dose of 5.0 c.cm. of a 2 per cent. solution is sufficient. The return of the sedimentation index with this dose is too slow to allow the dose to be exceeded in a majority of the cases.

'Reactions' are less commonly met with in the case of Alepol than with the oil or its ethyl-esters. Some patients show a considerable rise in the sedimentation index and a slow return to normal without manifesting any of the common reactions. The sedimentation index is therefore always a better guide to regulate the dose. The basis of our line of treatment was to maintain as high a resistance of the patient as possible and to give Alepol without markedly increasing the sedimentation index.

Summary and Conclusions

(1) Alepol, a soap derived from the lower-melting-point fatty acids of the hydnocarpus

oil, was used in the treatment of 200 cases of leprosy.

(2) The drug is given by intramuscular injections in the beginning and later by intravenous injections. The strength for the former is 3 per cent. and that for the latter 1 and 2 per cent. For intravenous injections Locke's solution without glucose is used to dissolve the drug, instead of distilled water.

(3) Improvement is seen most in A₁ and A₁B₁ types. B cases become stationary and improve very gradually. They become bacteriologically negative after a few months' treatment.

(4) The Wassermann reaction was positive in 70 per cent. of the cases, and more than 70 per cent. of the cases were infected with leprosy before the age of 40.

(5) The clinical results obtained with Alepol compare favourably with those obtained with hydnocarpus oil.

My thanks are due to Dr. C. Rammurti, Professor of Bacteriology, Medical College, Vizagapatam, for having carried out the Wassermann reactions, and to Dr. C. Seetaram Raju, Officer in charge, Skin Department, King George's Hospital, for help in giving injections to the patients and sending samples of blood for examination, and for active co-operation throughout this investigation.

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RELAPSE OF ACTIVE SIGNS IN 'BURNT-OUT' CASES OF LEPROSY

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THE term 'burnt-out' is used of that stage of leprosy when it is supposed that the causative organism has died out after a longer or shorter period, either naturally or as a result of some effective treatment. Leprosy in this stage leaves as sequelæ of its attack marked atrophies, contractures, trophic ulcers and mutilations. Though it is supposed that the causative factor of leprosy, the *Microbacterium lepræ*, is absent in these burnt-out cases, they sometimes relapse even after a long time and become most active and even infectious cases: hence

my reason for writing this note on the following cases.

Case 1.—Gyananda, admitted into the colony in 1922 as a case of B₁—A₂ (C₁) leprosy*. He became an apparently completely burnt-out case (N₂) in November 1930. By the end of 1927 he was being treated for necrosis of the tarsal bones which became worse from sepsis in March 1931. This necessitated amputation of the leg and the operation was done on 9th March, 1931. He was discharged quite fit on 23rd March, 1931. Depigmented patches were marked on the left brow and chin soon after discharge. On examination many bacilli were found in these lesions and he was re-admitted as a declared B₂ case (C₁) in June 1931.

Case 2.—Bhim, admitted on 14th February, 1929, as an A₂ (N₂) case, a burnt-out case with a septic ulcerated left foot. His leg was amputated on 6th March, 1929, and he was discharged from hospital on 30th March, 1929. He kept good health throughout. In the early part of April 1931 he complained of neuritis of the left ulnar nerve. The neuritis was rapidly followed by atrophy of the left hand and contractures of the left index and little fingers. In a very short period the pain became so much worse in the knee joints and also in the left hand that he had to be admitted into the hospital for anti-neuritic treatment. Depigmented patches have been coming out since then all over the body. On examination he was declared as reacting A₁ (N₂) on 16th July, 1931.

Case 3.—Susari, an old woman of 65. On admission into the colony on 29th May, 1930, she was an A₂ case with a septic ankle and with no other sequelæ of leprosy. The condition of the ankle became so much worse that an amputation as high as the lower third of the thigh was done on 28th November, 1930. In spite of her speedy recovery from operation she was kept all along in the hospital out of compassion for her age and condition. Five months after operation erythematous depigmented patches were marked on her right arm. After a few days a number of patches came out on the forehead and left arm and then on other parts. On examination she was declared an active A₁ (N₂) case on 9th July, 1931.

Case 4.—Gopal was a B₁ (C₁) case in February 1930. He became a burnt-out case in November 1930. His leg was amputated on 12th February, 1931, and he was discharged from hospital on 19th May, 1931. Recently he showed depigmented patches on both knees. On examination he was diagnosed as an active A₁ (N₂) case on 10th October, 1931.

Discussion.—Whether these are cases of reinfection or of relapse is the main point for discussion. In this colony, where there are more than 300 cases classified as 'burnt-out', all in the same environment as those reported above, why should only 4 cases recur? Three cases—Nos. 1, 3 and 4—showed patches so soon after being classified as 'burnt-out' that reinfection is out of the question, as the incubation period would be too short for leprosy. Many of the burnt-out cases suffer a lot every year from other diseases—e.g., malaria, diarrhoea, dysentery—which lower the vitality and decrease the power of resistance considerably. Yet in spite of this, it is very unusual

* The cases were marked before the new classification was introduced, so Dr. Muir's classification—A₁ for early nerve, A₂ for burnt-out, B₁ for early skin, and B₂ for moderately skin cases—is mentioned; and the new classification—N₁ for early nerve, N₂ for nerve cases with many patches, and C₁ for early skin cases—is put within brackets wherever possible.

for these patients to show signs of active recurrence of leprosy. Low vitality, loss of resistance—in some cases after surgical operation—cannot hold good as an explanation of the recurrence of the signs.

It is well known that the effect of sepsis in highly-advanced skin types of leprosy (C_3) is quickly to render them bacteriologically negative. Whether this beneficial influence is also exerted in the 'burnt-out' type of case as well, is a point worthy of consideration. In the cases quoted above it would appear as if sepsis in some way or another kept the causative factors in check. When the septic factor was eliminated—*e.g.*, by amputation—the lepra bacilli got a chance of rapid multiplication and so brought about active signs. An alternative explanation possibly is that amputation, in causing section of the infected nerves, may have liberated lepra bacilli—previously confined to the nerve trunks—which were then able to thrive in a body debilitated by sepsis and surgical operation.

Summary.—In four 'burnt-out' cases of leprosy, active signs of the disease recurred, in three within a short period, in the fourth after a prolonged period. The incubation periods were too short for re-infection to explain the recurrence in these cases. In one instance the signs of recurrent leprosy were so marked that the case was classified as a B_2 (C_1) one. It is interesting to note that in all four cases the active recurrence followed after surgical operation.

Conclusion.—The recommendation of the Manila Conference that the term 'burnt-out' should be changed to 'arrested, with mutilation' is justified.

My grateful thanks are due to Dr. E. Muir of the Calcutta School of Tropical Medicine and Hygiene, and to Dr. M. Wardman and Dr. G. Rao for their help and guidance.

AN EPIDEMIC OF JAUNDICE IN ALIPURAM JAIL, BELLARY, FROM JANUARY TO JULY 1931

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HISTORY OF JAUNDICE AT ALIPURAM JAIL

ALIPURAM Jail was opened in September 1921 with a population of 3,230 Moplahs, all concerned in the Moplah rebellion. The first cases of jaundice occurred in September 1922, but these were apparently ordinary cases of catarrhal jaundice and there were only 4 cases recorded for the whole year. I have shown in tabular form the number of cases that occurred during each year from the time the jail was opened. Table I shows the average population of the jail and the total number of cases that occurred during each year; table II gives the number of cases each year, month by month,

and graph I is a chart for 1929, 1930 and 1931. It will be seen from these tables and graph that the cases were of an epidemic nature during the years 1924, 1925, 1929, 1930, and 1931. The number of cases that occurred during the epidemic under report was completely out of proportion when compared with the other years, and the cases that were being admitted daily were so many that the outbreak called for special investigation to determine a causal factor. I am not able to trace reports on any previous investigations in this direction, and hence I presume that this is the first report on jaundice of this nature that has occurred in this jail. Till about the middle of 1930 the convict population of the jail consisted only of Moplahs. Between July 1930 and March 1931 about 1,500 political prisoners were accommodated here. It will be observed from table II in the years 1924, 1925, 1929,

TABLE I

Showing the number of cases that occurred each year as compared with the population

Year	Population	Number of jaundice cases	Percentage
1921	3,230	Nil	Nil
1922	8,272	4	0.04
1923	6,661	4	0.06
1924	5,372	52	0.90
1925	4,719	21	0.44
1926	3,981	1	Nil
1927	4,290	1	"
1928	3,814	3	"
1929	2,891	81	2.8
1930	2,837 (includes 500 Sathyagrahis).	21	0.7
1931	2,837	371	13.05

1930 and 1931, which recorded the largest number of cases, that there was no definite season during which these cases occurred, but at the same time it will be seen that the largest number of cases was admitted between February and April during the years 1929, 1930 and 1931 (*vide* graph I). In addition to the prisoners, a few of the jail staff and some persons in the neighbouring convent were also attacked during the epidemic under report. No cases were reported to have occurred in the town of Bellary. The Alipuram Jail is situated about three miles from the town.

INVESTIGATIONS MADE IN ORDER TO DETERMINE A CAUSAL FACTOR

These investigations were chiefly directed towards the isolation of leptospiræ, as Weil's disease is prevalent in the Andamans, and some prisoners were transferred from there to this jail. In addition to all possible sources of infection being most carefully examined by the jail medical staff, a unit under Dr. Sanjeevarao, M.B., B.S., arrived from Guindy, Madras;

is an everyday event in the routine of a bacteriologist's work, but a combined method of serum diagnosis and clot culture does not seem to have been followed as a routine measure. I am indebted to Dr. Dalal, Professor of Bacteriology, Grant Medical College, for suggesting to me to follow this method which was referred to in the *South African Institute of Medical Research, Annual Report 1929*. I have tried to follow this method in 70 cases of blood samples sent for Widal reactions from the different wards of the Sir J. J. and allied hospitals in Bombay. The technique and the advantages of this method over others, and the results obtained therefrom, form the subject-matter of this article.

The routine method of hæmoculture followed here is to inoculate a 100 c.cm. flask of bile broth with 10 c.cm. of whole blood, taken with due aseptic precautions at the bedside of the patient; the bile broth is incubated for 24 hours at 37°C. and is then tested for the suspected organism.

Method of clot culture.—Five cubic centimetres of blood is obtained aseptically from the vein of the suspected case of enteric infection and is sent in a sterile test tube for Widal reaction and clot culture. The whole of the serum from the tube is removed with aseptic precautions and part of it is utilized for the agglutination test for typhoid, and paratyphoid 'A' and 'B' by Dreyer's method. The remaining serum is stored in a sterile capillary pipette for future use. The clot is then transferred to a sterile tube of ox-bile, which serves as a culture medium. Fresh ox-bile is obtained from a slaughter house, filtered and filled into sterile test tubes, about 10 c.cm. in each. All these tubes are autoclaved for 20 minutes at 120°C. and stored for use. The tube of ox-bile with a transferred clot, after proper labeling, is incubated for 24 hours at 37°C. Usually organisms grow in the medium by that time and are easily made out in a hanging-drop preparation. From this bile tube a sub-culture is made in simple broth, and an agar slope and sugar media are also inoculated. After incubation for a further 24 hours, the broth culture is available for testing the motility of the germ, the ordinary agar growth for staining reactions and for agglutination with high-titre sera. Sometimes young cultures are non-agglutinable, and here sugar reactions in such instances will confirm the identity of the organism.

The point of interest in doing cultures by this method is that occasionally after 24 hours in bile medium, no organisms are seen in the hanging-drop preparation nor does any growth occur in simple broth or on the agar slope sub-cultured from the originally-inoculated bile tube. Under these conditions a negative conclusion should not be drawn but the bile tube should be further incubated for 24 hours and then sub-cultures should be done. I have come

across this finding occasionally during this investigation and I do not discard the bile tube as sterile or negative, unless it is tested as described above for three successive days. In spite of strictest attention and regard for aseptic manipulations and the inhibitory action of bile on the growth of various other organisms, occasional contaminations in the bile tube are met with and thus further complicate the work of isolating the organism.

Out of 70 samples of blood tested for Widal reactions and clot cultures 26 turned out to be positive for enteric infections.

Out of 26 positive samples 24 were positive for typhoid, 2 were positive for paratyphoid 'A' and none for paratyphoid 'B'. There were 12 which gave Widal positive and clot negative. There were 6 which gave Widal positive and clot positive. There were 5 which gave Widal negative and clot positive (when no hæmocultures were asked for).

There was 1 which gave Widal negative and clot positive (hæmocultures were done and were positive).

There were 2 which gave Widal positive and clot positive (hæmoculture was asked for and both were positive).

Discussion of the advantages of the combined method over the single method of serum diagnosis or hæmoculture

1. Serum diagnosis and hæmoculture are done from the same sample of blood.

2. At times blood sent for the Widal reaction is negative and hæmoculture of that patient is not asked for; the clot culture turns out to be positive for one of the enteric group of organisms (as shown in the table). This result is very important for the physician or the medical practitioner who, in the absence of such a definite and useful finding and with a negative Widal report sent to him, would very likely treat the case as non-enteric in the general ward of the hospital or at home, with the attendant danger of infection to the whole ward, attendants and staff. From the point of view and interest of the patient, it is equally gratifying to get this finding from the clot culture as, in its absence, he is denied the most important line of treatment, that is most careful and efficient nursing, on which so much depend his chances of successful recovery.

3. The clot, when cultured, is practically free from the serum-agglutinins and thus gives a better chance of a successful positive culture; successful cultures from the clot have been obtained after keeping it in the ice chest for 2 to 3 days.

4. Very often enteric infections run a very atypical course from the beginning, or sometimes these are followed by complications and relapses; in such cases the patient does not give a proper and correct history of his illness when admitted to the hospital or at home, the attending physician, with all his clinical acumen,

TABLE

Serial number	Date	Widal test	Clot culture	Blood culture	REMARKS
1	28-11-30	+	<i>B. typhosus</i>	..	10th day of fever.
2	"	+	"	<i>B. typhosus</i>	10th " " "
3	4-12-30	H —	Sterile	..	12th " " "
	16-12-30	O +	<i>B. typhosus</i>	..	24th Patient died.
		H +			
4	11-2-31	O —	<i>B. typhosus</i>	..	Fever 1 month.
5	18-2-31	+	"	..	18th day of fever.
6	1-7-31	+	"	<i>B. typhosus</i>	10th " " "
7	3-1-31	—	<i>B. typhosus</i>	..	8th day of fever.
8	28-2-31	—	"	..	22nd " " "
9	21-5-31	—	"	..	24th " " "
10	4-8-31	—	"	..	9th " " "
11	10-8-31	—	"	..	15th " " "

Note:—No hemoculture was asked for by the physician; blood was only sent for Widal reaction

12	28-11-30	+	<i>B. typhosus</i>	<i>B. typhosus</i>	10th day of fever.
13	27-2-31	—	"	"	7th " " "
14	1-7-31	+	"	"	10th " " "

Note:—Out of 12 hemocultures done for enteric infections only three were positive

15	16-12-30	+	Sterile	..	28th day of fever.
16	20-1-31	+	"	..	15th " " "
17	26-1-31	+	"	..	17th " " "
18	8-2-31	+ Para A	"	..	12th " " "
19	12-2-31	+	"	..	17th " " "
20	24-2-31	+	"	..	40th " " "
21	28-2-31	+	"	..	28th " " "
22	2-4-31	+	"	..	8th " " " Broncho-pneumonia, patient died.
23	27-6-31	+	"	..	15th day of fever.
24	2-7-31	+	"	..	20th " " "
25	20-7-31	+	"	..	18th " " "
26	28-7-31	+ Para A	"	..	12th " " "

Footnote:—The Widal reaction is taken to be positive in a serum dilution of 1 in 50 and higher; and the standardized agglutinin suspensions from the Standards Laboratory, School of Pathology, Oxford, were used.

The day of fever mentioned in the remarks column indicates the day on which the Widal test and clot culture were done.

hesitates between a Widal reaction and blood culture or sometimes asks for both on different days; and it is at such a juncture that the combined method of clot culture and Widal reaction comes to his rescue. Besides, the agglutinin titre of the serum in enteric infections is always fluctuating during their course, and as a result of this a single Widal test possesses practically no value. To test the sample of blood of the same patient twice, thrice or four times and obtain a gradual rise in the agglutinin titre of the serum has more practical importance. Under the above-mentioned conditions, even if the Widal test be negative, clot culture is bound to turn out positive for the causative organism, thus providing an unchallengeable proof as to the nature of the infection.

5. Apart from the difficulties and fallacies in the clinical diagnosis, the serological reaction, even when done under standard conditions, is not free from sources of error, as is made evident from the recent work of Felix and Olitzki

(1928) on two types of antigenic structure, the flagellar or 'O H' and the somatic or 'O', which react differently with the corresponding agglutinins. These workers have shown that sometimes H agglutinins of the serum are either not developed or they are absent; while the O agglutinins present in the serum react only with the special 'O' antigen. This means that Dreyer's simple method for the Widal test is further complicated and requires testing the serum with 'O' antigen also. In the words of Gardner (1929) 'when the customary H Widal is negative, as in those cases where no appreciable H titre develops or sometimes after developing, it disappears, an adequately high O titre will give the diagnosis of enteric group of infections'. But it is not possible, however, to identify the infecting species by this test, as the 'O' substance is not specific. Here then lies the decided superiority of the combined method over a single hæmoculture or a single Widal test, done in the usual way or modified for testing O agglutinins. The non-specificity

of the 'O' substance is the greatest drawback in the diagnosis, except in the inoculated cases, where it is of the greatest importance.

The applicability of this combined method of diagnosis in inoculated cases will then become of very great interest, as Ledingham (1921) has very rightly insisted that no efforts should be spared to establish a diagnosis on this firm foundation and that the results of agglutination tests, however carefully performed, can never have the same validity as the actual isolation of the causative organism.

6. During this work I have been able to isolate the causal organism from the clot during all the stages of the clinical course of enteric infections, and it follows that the general belief that the causative organism can be isolated from the blood only during the first week, is not borne out by the findings of the clot-culture method. These periods often overlap and are only classified to get the maximum chance of obtaining cultures or serum tests positive.

7. This method is particularly suitable for private practitioners not attached to the hospitals, who cannot afford to keep culture media with them, and who very often have to send blood long distances to a bacteriological laboratory. They have only to take the blood aseptically from a vein into a sterile tube (both these conditions must be strictly followed) and despatch it in the most suitable way. The clot can be cultivated even after two to three days in this climate.

8. The last and the most important advantage from the bacteriologist's point of view is that he is easily able to collect a large number of different strains of the organism concerned, with different clinical pictures which he may in his spare time study, classify and differentiate in their antigenic behaviour. I have been able to collect a dozen strains of *B. typhosus* by this clot method during the last ten months of my investigation, whereas depending on the hæmocultures asked for by physicians not more than one or two strains were obtained every year.

Besides obtaining various strains, recovery of the organism from the clot is one of the indispensable findings to one who is specially concerned with the investigation of determining the presence or the titre of O H and O agglutinins of the serum in infected cases of enteric. From the evidence of the few cases which I have investigated in the light mentioned above, I suggest that during the course of infection, some correlation exists between the presence of O H and O agglutinins in the serum and the presence of the organisms in the blood at the same time, which markedly influences the prognosis of the case.

In conclusion I strongly advocate this combined method, considering the simplicity of technique, the advantages and valuable information obtained either for the attending

physician or bacteriologist and I hope to find this method given a wider trial in future.

Finally, I am very grateful to Dr. Dalal, Professor of Bacteriology, Grant Medical College, and the staff of the department of Bacteriology, without whose co-operation I would not have been able to do this work.

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A PLEA FOR THE USE OF SUCTION

By S. S. BANKER, L.M. & S., L.R.C.P.E., D.T.M. (L'pool)
District Medical Officer, B. B. & C. I. Railway, Dohad

READING modern literature in surgery one constantly comes across the use of suction apparatus for keeping the field of operation dry, and for removing fluid from deep cavities. It was in 1926 that Sir W. I. de C. Wheeler brought the use of suction and illumination of the field of operation into prominence by his résumé of some recent articles on the subject in the *Medical Annual*, 1926, page 444. Being very keen to try it, I wrote to some instrument manufacturers in England for the type of suction apparatus depicted in the *Annual*, but I was disappointed to hear that it would not work on my water tap. It required a particular minimum head of water to work the apparatus, and that I could not get from the overhead tank of our hospital. I searched high and low for different types of suction apparatus in the instrument catalogues of different makers, but the prices were prohibitive. Coming across Braun's catalogue, I saw a very simple, efficient, and cheap little pump that would work on even a low head of water, and I decided to get one. The pump has been with me now since March 1930, and I have been so satisfied with its performance that I have no hesitation in recommending it to the profession. It is sold in two varieties, one with a universal adaptor to a water tap, and the other without. I recommend the former, as without such a rubber adaptor, the pump would become more or less useless. I have fixed this pump to the tap of the wash-hand basin in the theatre after removing the fan-shaped piece of the metal which is supplied with modern wash-hand stands. This fan-shaped piece is removable, and in its place a right-angled piece of metal tubing is placed in which the rubber attachment of the pump is fixed. This metal tubing must be made of the exact diameter to fit in properly. This will have to be made locally, as the makers do not supply it. All that it now requires is turning on the tap, and according to the quantity of water flowing

through, the necessary degree of suction can be produced. It is advisable not to turn on the tap full at once, but to regulate it slowly, otherwise the tissues will be sucked in quickly and block the action of the tube. The pump is connected by a piece of 'pressure rubber tubing' (thick enough not to be collapsed by suction; ordinary rubber tubing, however strong, is useless) to any sort of metal or glass tube which is to go into the wound. I have had made locally different sorts of tubes for different purposes. For abdominal work I recommend Braun's drainage glass tubings. These are excellent. The whole of the pressure rubber tubing need not be sterilized, but I interpose a piece of pressure tubing about 2 feet long with a glass connection which is

I find it very useful in any operation in the mouth, especially multiple extraction of teeth for pyorrhœa, tonsilleotomies, etc. The method I use for wholesale extraction of teeth is as follows. I always take out all the top teeth first, preferably on both sides unless the patient is very weak. The reason why I do not take out the bottom ones first is that when the sockets are open, they are liable to be contaminated by pus from the top ones. I do not use local anæsthesia, that is to say, I do not infiltrate the gums, which are always retracted and unhealthy. Besides it interferes with clean and rapid healing in these cases. I do a regional anæsthesia by injecting 5 c.cm. of a 2 per cent. solution of novocain adrenalin through the outside of the cheek by infiltrating

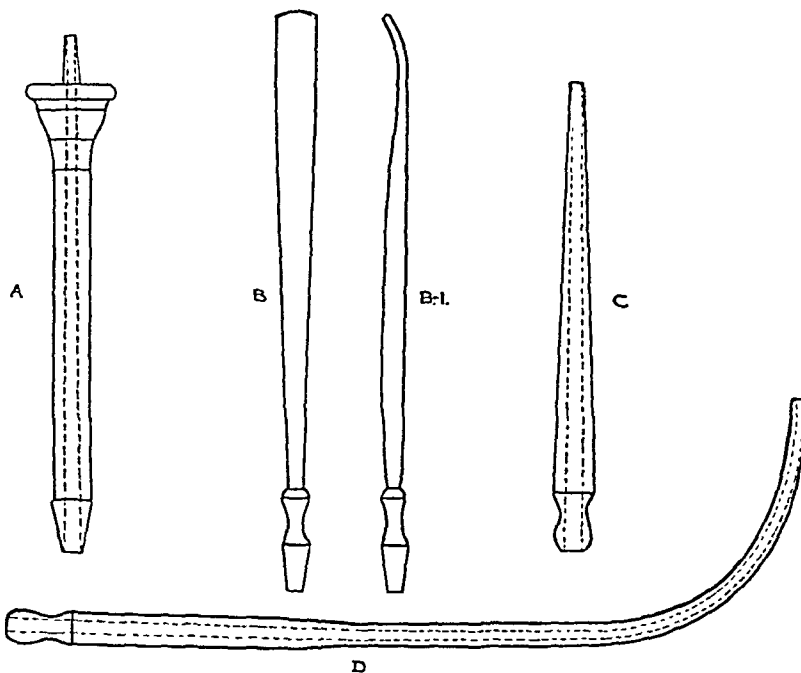


Fig. 1.—Shows the various attachments made locally.

- A. The mount of a 10 c.cm. syringe, mounted on a piece of hollow metal tube which serves as a handle. Any size needle can be fitted on the mount and used for exploratory or therapeutic purposes.
- B. The flat one is useful in aseptic operations to keep the field of operation dry.
- B-1. Side view of B.
- C. A straight metal tube.
- D. The curved tube is useful for working in deep cavities.

sterilized along with the instruments, so that handling this piece does not contaminate the field of operation.

One has only to use suction to appreciate its value. The great advantage is that it keeps the field perfectly dry, and it is very easy to pick up bleeding vessels, and that it does not bruise the tissues as gauze sponges do. I think it is an ideal method to use in abdominal work where delicacy in sponging is so essential. Incidentally, one has to realize the amount of saving in gauze sponges, and in these days of economy this is a factor worth consideration.

the superior dental nerves. The technique is as follows:—

Locate the lower edge of the zygomatic arch with the finger. Draw an imaginary line from the external border of the orbit. The point of intersection of the two lines is the point for introduction of the needle. Use a needle 10 cm. long. The needle is inserted to a depth of 5 to 6 cm., and it should aim at the tuberosity of the superior maxillary bone. Then inject 5 c.cm. of the solution, draw out the needle rapidly, and apply pressure from outside the cheek for about two minutes. This injection anæsthetizes the upper molars, premolars as well as the mucous membrane of the maxillary sinus. Use a sharp needle with a small bevel. The patient hardly feels the injection then. Do not hesitate while pushing the needle, but I would insist that every time the anæsthesia

is done (unless one is doing it frequently) the surgeon should have a look at a skull to refresh his anatomy, and to visualize the structures at the time of puncture. Sometimes the anaesthesia extends as far as the incisors. If not, infiltrate locally with a 1 per cent. solution of novocain adrenalin. By injecting the other side of the face the whole of the upper jaw can be done at one time.

It is in such cases that you will appreciate what suction does. It sucks out all the pus and the detritus from round the sockets, and no septic material will escape down the throat, and without using a single swab to clean the throat the operation will be completed with great comfort to the surgeon and the patient. As each tooth is pulled out, apply the suction tube over it, and then cover the socket with a small pledget of lint before you go on to the next tooth. It is remarkable how rapidly and firmly the gums heal, thus enabling a good fitting of dentures subsequently. Besides the patient gets no reaction from septic absorption from the sockets after such extensive extractions, and in four to five days the gums are healed. The teeth from the lower jaw can be done by infiltrating the inferior dental nerves on both sides near the inferior dental foramen. The technique is as follows:—

'The patient is seated in front of the operator, with his mouth wide open. The index finger is passed into the mouth, the anterior border of the coronoid found, and within this border the retromolar trigone (Braun) located. A needle 9 cm. long is taken in the right hand, and being kept 1 cm. from the inferior canine on the opposite side, on a level with the grinding surface of the teeth, is directed toward the trigone, i.e., the intra-buccal fold of the coronoid. The point of the needle penetrates the mucous membrane 1 cm. above and outside of the last molar. As soon as the membrane has been punctured the point strikes against bone; if not, the point is too far within. Then the operator, feeling his way, inserts the point of the needle until it reaches the ridge of the bone. It should slide along the inner surface of the inferior maxillary; then, without losing its contact with the bone, penetrate 2 to 2.5 more centimetres, at which point the operator injects 5 c.cm. of a 1 per cent. solution'.

A case which impressed on me the value of suction in our practice was that of a brilliant surgeon doing a plastic operation after resection of the tongue for a cancerous growth some five years ago. The patient was put on the operation table, and every one was anxious to see the operation. The surgeon was most optimistically cutting the flaps, and the assistant mopping hard at the discharges as they emerged from the throat on the outside wound on the neck. To the surprise of everyone the patient became cyanosed and stopped breathing. Of course the poor anaesthetist 'got it in the neck' but I am sure that that patient died either from vigorous mopping with sponges, this causing spasm of the glottis, or obstruction of the larynx by blood clot. I am certain if suction had been employed, no such catastrophe could have happened. Working in a limited and deep space such as the throat there can be nothing better than suction. The patient

is spared the disgusting and annoying sense of retching. Surgeons would find it extremely useful in tonsillectomies for adults as well as for children instead of constantly mopping with sponges. Some enterprising surgeons will find that they will be able to do suction tonsillectomy according to Waring's method by applying tonsil cups to the suction apparatus. It is a very pretty operation, and I would like to see it done by surgeons in India. Personally, I have given up all cutting operations on the tonsils in adults in favour of electrocoagulation which I think is the ideal method in adults. For children Sluder's operation is the best.

I shall now come to another use of suction. Most hospitals are supplied with either a Potain aspirator or Dieulafoy's. These wonderful instruments have as a rule a happy knack of being out of order just when you want them. Besides, those annoying washers and puzzling connections have floored many a student in his examinations. All these could be avoided by mounting any size of needles on the suction tube. If any fluid is wanted for

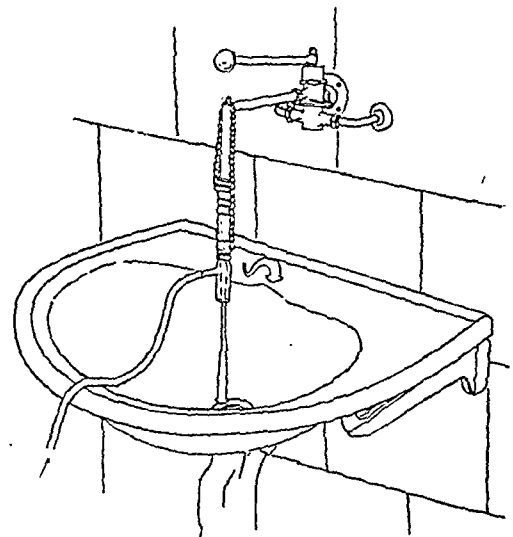


Fig. 2.—Shows how the pump is fixed to the water tap with the interposition of a right-angled piece of metal tubing. Note the knob where the right angle is formed. This is to slip the chain on so that there is no chance of the chain slipping off and loosening the pump.

examination, a bottle with two glass tubings, one attached to the tube going to the needle, the other going to the pump, can be interposed. A very useful mount for the needle can be made out of broken 10 c.cm. or 5 c.cm. Record syringes. Remove the mount in which the needle fits and have a metal piece put on, which serves as a handle. This can be made locally.

Suction can be used in this manner to remove fluids from practically any cavity in the body, e.g., pleura, pericardium, abdomen (gall bladder, urinary bladder, ascitic fluid, ovarian cyst, etc.).

Surgeons will find it a great help in doing mastoid operations. Keep the suction working all the time, and it is astonishing how it helps

the operator in getting a clear view, and what is most important, when working near the sinus it sucks up all the dirty granulations which one dreads to remove with the curette.

Coming to small operations suction is very useful for evacuating large abscesses, ordinary and tuberculous. Make an opening $\frac{1}{4}$ inch long, and insert the end of the suction tube in it. It is so pleasing to find that if done properly hardly a drop of pus escapes on to the towels. It is a clean and rapid method and saves you from squeezing the abscess. After the pus is evacuated make a longer opening or counter openings as the case requires. For boils I use the ordinary eye dropper. It sucks out the core without squeezing. Incidentally think of the saving in swabs when you are dealing with large abscesses.

Suction in abdominal work.—Lake has some interesting remarks regarding this. 'A suction apparatus', he states, 'shortens the time taken considerably, and the peritoneal cavity is emptied more completely than by any other means. Surgical instinct shudders at seeing a large cotton swab pushed into the pelvis, twisted around and then withdrawn, bringing with it portions of detached endothelium and much valuable lymph'. I commend the abdominal tubes made by Braun. They are excellent.

Suction has tremendous possibilities in surgery if one makes intelligent use of it.

I am very much indebted to Dr. S. A. Wilkinson, Acting Chief Medical Officer, B. B. and C. I. Railway, for allowing me to publish the above.

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A Mirror of Hospital Practice

A CASE OF SYPHILIS OF THE LUNGS

By G. R. SAPRE, L.C.P.S. (Bom.)

Haddo Hospital, Port Blair

CONVICT G, Hindu male, aged 37 years, was admitted to Haddo Hospital for benign tertian malaria on December 29th, 1930. He had frequent relapses, the result being that he developed anæmia. His hæmoglobin value fell to 40 per cent. and cachexia was marked; for this he was treated for a long time, but with poor result. The case appeared to be very refractory. He was periodically overhauled, but no definite cause could be assigned for his general running down in health.

Previous history.—He had been in Port Blair for 14 months; he had suffered from malaria twice; his original weight was 115 pounds.

By about February 20th, 1931, the patient developed a distressing cough with abundant muco-purulent expectoration and occasional dyspnoea, the onset of these

symptoms being insidious. There was no foetid odour about the breath or expectoration; the latter occasionally had a tinge of blood in it. There was at this time no pyrexia and no night sweats. The lungs showed basal crepitations, but the apices were free; later on, scattered patches of consolidation became evident in the middle and lower lobes of both lungs, but the pleuræ were not involved. The general condition of the patient was not suggestive of broncho-pneumonia. Toxæmia was absent, constitutional disturbances were slight, but asthenia was progressive. The case appeared to be a very obscure one, and while pulmonary tuberculosis was regarded as a possible cause the clinical picture did not suggest it. The sputum was examined repeatedly, but tubercle bacilli were not found.

A provocative injection of sodium morrhuate was given, but a specimen of sputum examined after the injection was also 'negative'. Routine examination of the urine gave no clue, nor did the stools. The spleen was hardly palpable and the liver was normal; the case thus becoming more and more obscure. On April 10th, 1931, the patient was shown to Major A. J. D'Souza, Senior Medical Officer, Port Blair, who after a thorough examination found enlargement of the epitrochlear and posterior cervical glands, and after taking into consideration the condition of the lungs expressed the opinion that the case was probably one of syphilis of the lungs, in spite of the absence of other manifestations of active syphilis. Needless to say that he advised specific treatment.

On further enquiry it was found that the patient about 15 years ago had not only suffered from a genital sore, but had also developed secondary rashes, evidence of which was to be found in a few black pigmented areas scattered all over the body.

When he was put on specific treatment his most distressing cough almost entirely disappeared. A full course was given; this took a little over two months. At the end of this time the patient was an entirely different man.

Besides the disappearance of his distressing cough the physical examination showed that the lungs had cleared up and were in a healthy condition; the hæmoglobin percentage rose to 75; the weight shot up from 79 pounds to 92 pounds, and the patient felt generally better and stronger, and had no complaint of any sort. I think the therapeutic test leaves scarcely any doubt as regards the authenticity of the diagnosis, also the Wassermann reaction was strongly positive.

It will be of some interest to note that a skiagram taken on June 17th, 1931, showed marked hilar enlargement; this may at first sight be suggestive of tuberculosis, but the fact that syphilis of the lungs has generally a tendency to invade the root of the lung should not be overlooked while interpreting such hilar enlargements. The immediate response to specific treatment should exclude any possibility of tuberculosis, in spite of the fact that syphilis and tuberculosis could coexist. My own opinion, however, is that the lung condition was purely syphilitic.

Points of interest in the case are:—

- (a) the insidious onset, (b) the disproportion between the symptoms and physical signs, (c) the absence of tubercle bacilli despite repeated examinations, (d) the strongly positive Wassermann reaction, (e) the absence of manifestations of active syphilis elsewhere, and (f) the value of the therapeutic test.

In conclusion, I must thank the Senior Medical Officer, Major A. J. D'Souza, M.C., I.M.S., for his permission to publish the case

notes, as well as for the help in diagnosis in this case, which had it not been for him would have probably remained obscure.

ASPHYXIA PALLIDA

By DAVID PERERA

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Bandarawela, Ceylon*

On 1st September, 1931, at 8 p.m. I was called in to attend on an Indian lady who was in protracted labour pain. The patient was about 37 years of age and a multipara, this being her tenth baby. Her last child was still-born and was delivered with the aid of instruments. She had apparently been in labour for 3 days and the membranes had ruptured early that morning. I found her in a very exhausted condition with hardly any pain then present. The patient insisted on the baby being extracted under chloroform, as on the previous occasion. I gave her an injection of 0.5 c.cm. of pituitrin and a short time after she developed vigorous pains and delivered a baby girl in a lifeless condition, with a very long cord wrapped round her chest and neck, and her head hanging. We released the cord and extracted mucus from the mouth with the aid of a mucus extractor, put the baby into a hot water bath, and inserted the middle finger into the rectum—as advocated by Dame Louise Maclory, and recommended by Lieut.-Col. Green-Armytage (1930). Unfortunately I had no adrenalin chloride in my bag; however, a third part of a 0.5 c.cm. bulb of pituitrin was injected into the biceps, and after a few minutes the baby started to breathe in a gasping manner. After another half hour she commenced to cry and to breathe normally. The baby was kept in the bath for two hours; after this Eau de Cologne was applied, the infant was wrapped up in flannel, and handed over to the attendants.

Since this case we have saved several babies from white asphyxia by this simple method, with and without injections.

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A CASE OF SEBACEOUS HORN

By PHANIBHUSAN MUKERJEE, L.M.P.

Chakmehsi, Darbhanga

A HINDU Brahmin male, a priest by profession, aged about 65, a resident of a neighbouring village, presented himself to this dispensary in July 1930 for the treatment of a horny growth, which was projecting outwards from the middle of the left side of his chest, like a finger, $2\frac{1}{2}$ inches in length; the distal part was bent a little downwards.

The patient stated that about a year ago the tumour appeared as a small pimple which gradually increased in size. At first it was soft but tender. After about 6 months of its development the growth burst and out of it came a thick creamy fluid. The discharge continued for two months, but the tenderness subsided a little. Subsequently the oozing stopped and the mouth of the wound closed of itself, whereafter the tumour began to grow hard, painful and tender. As the growth increased steadily in size, the pain and tenderness were aggravated, so much so that the patient was unable to put on any clothes, the very contact with

which caused much pain and made him miserable.

The steady growth of the tumour and the constant pain compelled him to seek relief and he came to this dispensary for treatment.

Treatment.—Due asepsis having been observed, a circular incision was given round the tumour at its base. It was freed from adhesions and excised. The part was touched with tincture of iodine, a few stitches applied and finally the wound was sealed up with compound tincture of benzoin. The wound healed in about a week.

On removal, the tumour looked very much like a curved finger; it was horn-like in appearance and feel; and it measured two and a half inches in length and a quarter of an inch in diameter. It has been sent to the pathological department of the Darbhanga Medical School, where it is kept as a specimen.

In Rose and Carless' *Surgery* the description of sebaceous horn is given, as quoted below:—

'Left to themselves the sebaceous cysts may attain considerable dimensions, whilst the walls and contents become calcified. Occasionally the exudation oozes through the duct, and dries on the surface, with just sufficient cohesion to prevent it from falling off; layer after layer of this desiccated material is deposited from below, finally giving rise to what is known as a sebaceous horn'. 'These become dark in colour from admixture with dirt, and are always more or less fibrillated in texture'.

From the history of this case, it would appear that the tumour was at first a cyst which after some time burst; the discharge continued for some time, stopped and finally the horny projection was formed. The tumour is dark in colour and appears fibrillated in texture as described by Rose and Carless.

More than a year has elapsed since the tumour was excised, no recurrence has yet taken place and the patient is doing well.

As such cases are rarely met with in practice, I am sending the notes for publication.

Special Articles

GYNÆCOLOGY IN THE TROPICS

POST-GRADUATE CLINICAL LECTURE NOTES (CONTINUED)

By V. B. GREEN-ARMYTAGE, M.D.

F.R.C.P. (Lond.), F.C.O.G.

LIEUTENANT-COLONEL, I.M.S.

Professor of Midwifery and Gynæcology, Calcutta Medical College, and Surgeon to the Eden Hospital for Women, Calcutta

STOCK-TAKING is as important in surgery as in business, for it allows a review of technique and results which is of advantage to both surgeon and patient.

An experience of over six thousand abdominal operations convinces me that, in the tropics, the surgeon who can operate rapidly or 'to the clock', and aims at a minimum of bleeding gets the best results, for just as post-partum hæmorrhage is often fatal from shock or sepsis in the East, so is hæmorrhage in gynæcological surgery, where two-thirds of one's patients are debilitated or suffering from long-standing morbid pelvic conditions.

With this conviction I thought it would serve a useful purpose to consider the subject of hysterectomy, for, admitting the frequent necessity of this operation, general practitioners and nurses and, through them, the public, form the erroneous idea that such an operation is commonly fatal, with the result that patients put off surgery, and oftentimes arrive with uterine conditions that have been allowed to exist far too long or have been *mistreated* by radium and x-rays.

For this reason and without any bias, I am presenting to you my results obtained in the Eden Hospital during the last ten years, which have been collected by my registrar, Dr. Radha Raman Roy, omitting entirely my results obtained in private cases, for they, being mostly pure Europeans and cases seen early and in good health, would vitiate the point I want to make—a point I may say which is entirely to the benefit of Indians and Anglo-Indians—namely, that in the hands of an experienced surgeon the mortality of hysterectomy is under 5 per cent.

For instance, take vaginal hysterectomy, a procedure of which the great French surgeon Doyen used to say that 'no man could call himself a gynæcologist unless he could do this operation in private'.

The indications for vaginal hysterectomy in the tropics are many, and it has quite peculiar attractions for patients in India, who will allow any operation from below rather than have their 'stomachs cut'.

The technique should be nearly bloodless and there is no shock. It is particularly applicable for ovarian menorrhagia; for chronic metritis; for cancer of the body of the uterus, the so-called pre-cancerous, eroded, lacerated cervix; and for fibroids up to the size of a tennis ball. Very occasionally it is useful in a case of prolapse.

My hospital registrar reports that 190 of these operations have been performed during the last ten years with a mortality of 9, i.e., a death rate of 4.7 per cent. During the same period in the same class of patient, 350 subtotal hysterectomies have been performed with a mortality of 18, i.e., a death rate of 5.1 per cent., whereas 375 total hysterectomies have been done with a mortality of 21, i.e., a death rate of 5.6 per cent.

I think if these unbiased statistics were realised by doctors and patients alike there would be far less delay in sending cases to

hospital, for it is hardly necessary to state that many of our hospital cases arrive in a desperate clinical condition, so making our mortality for hysterectomies in the Eden Hospital, almost exactly double that of hospital surgeons in the West.

This finding is of additional interest, in that, last year when I published my results of 547 operations for ovarian tumours in the Eden Hospital, I found that my average total mortality for innocent tumours was 5 per cent., a ratio almost double that of Great Britain, the explanation being of course, as you know, that ignorance and prejudice delay a patient's arrival at hospital in India, until her clinical condition is desperate.

For obtaining such results my sincerest thanks must be tendered to the skilled pre- and post-operative care of my house and nursing staff.

In addition, I have asked Dr. Roy to collect the number and results in connection with extra-uterine gestation during the last ten years, for here again, because of fear of operation or bad diagnosis, patients are oftentimes brought to hospital almost *in extremis*.

The total number of cases is 106, with an operative mortality of 9, i.e., a death rate of 8.5 per cent.

The operations undertaken show that 51 were tubal pregnancies, 2 were in the broad ligament, 45 were ruptured tubal gestations, and 8 were secondary abdominal pregnancies.

Cancer of the cervix

In the East, cancer of the cervix is extremely frequent, its common incidence under the age of 30 being due to early marriage and early child-bearing. Unfortunately, owing to ignorance and prejudice, the diagnosis is an easy matter, for 9 out of 10 cases presenting themselves are beyond the permanent help of radium or surgery. It is for this reason that every regard should be paid to all predisposing causes of cancer of the cervix such as lacerations. For an erosion, associated with or without laceration of the cervix, is an inflammatory reaction of the tissues to infection and irritation. We should, therefore, drop the term 'erosion' for the correct title 'cervicitis', an erosion being the outward and visible sign of an inward and invisible inflammation of that pelvic tonsil, the cervix.

The recent work of Bailey, based upon the histological examination of 850 specimens of the cervix, shows that the relationship of chronic cervicitis to cancer of the cervix, is affected through the agency of a factor common to both, namely, an associated inflammatory exudate in contact with the cervix. As a result of this inflammation, bacterial or chemical irritants in the cervix initiate cell proliferation. This being so, it is the duty of the general practitioner to investigate the cervix with a speculum in all cases of discharge in a parous woman.

Again and again during the last ten years I have inveighed against tinkering gynaecology. By this I mean the almost disgraceful way in which so many of these cases are still treated by so-called gynaecologists—I refer of course to such methods as repeated weekly or bi-weekly paintings of the cervix with acids or caustics, which while doing no good to the patients, swell the banking account of the doctor.

The only treatment is either radical electro-cauterization, using the comparatively cheap post-cautery, supplied by Thackray of Leeds, or amputation of the cervix. I have used the former method in hundreds of cases now, and can categorically state that if the patient will douche twice a day with a salt solution for six weeks afterwards, she will be cured. Moreover, many patients who have been so treated have become pregnant again after long periods of comparative sterility, caused by the discharge from the cervix having killed or inhibited the passage of the spermatozoa.

Post-cautery treatment needs no anaesthetic in most cases, and can be done in the consulting room.

The disadvantage of the Bonney amputation is post-operative sterility, a sequela which does not take away from its attractiveness to many.

In India the treatment of cancer of the cervix is practically the one word 'radium'. But because the cases are invariably seen late the results are most disappointing. It is a terrible statement to make but nevertheless a true one that out of scores of cases of cancer of the cervix that I have seen during the last ten years, not one treated by radium has been alive at the end of two years. Whereas four early European cases, all diagnosed microscopically beforehand, are alive 5, 6 and 8 years after operation.

In view of these facts it is important that both laymen and doctors should understand that in Europe the proportion of absolute cures after either radium or operation in early cases is about the same, namely 35 per cent. only.

To show you the frequency of cancer, I have asked my registrar to collect our out-patient statistics for the last ten years. He shows that 542 new cancer cases attended and that this number makes a 1.10 per cent. proportion of the total out-patient attendance. This fact should dispel for ever the statement made by European cranks that cancer does not occur in India.

Benign hæmorrhage from the uterus

Every now and then you will be faced by cases of this nature. There is no fibroid, no placental polypus, no cancer, no enlargement of the uterus, no inflammation of the tubes and ovary, no retroversion, no cervicitis, and yet the patients bleed 10 to 15 days every month and the 'periods' recur nearly every two weeks.

Blood examinations do not show anything beyond anæmia.

What is the cause of this bleeding?

In young unmarried girls, undoubtedly hypothyroidism is a cause, for the exhibition of thyroid and iodine, together with change of climate and a full calcium diet will often cure such cases in six weeks, but in older women the problem is by no means so easy, for with or without any metritis there is great hyperplasia of the lining membrane of the uterus—indeed, an exaggeration of the normal premenstrual congestion of the endometrium.

In a great many such cases I have done vaginal hysterectomy and in some abdominal hysterectomy, but the interesting point is that in two-thirds of these patients I have found the ovary hard and atrophic, whereas in the remaining third the ovaries were swollen and œdematous, presenting the appearance of glistening testicles.

With our recent knowledge of the female sex hormone these findings suggest that the hyperplasia of the endometrium is due to non-formation of the stratum granulosum of the corpus luteum, for repeatedly I have been unable to find any lutein formation in either type of ovary.

The absence of a corpus luteum suggests that the hæmorrhage is due to an excess or uncountered action of hormones from an unruptured Graafian follicle, for we know that when a follicle is able to burst on the surface, and the escaping ovum dies, the stratum granulosum of the corpus luteum supplies a hormone which causes complete necrosis or disintegration of the endometrium—this necrosis is menstruation.

Admittedly this is a theory based on clinical findings, but such pathology of the living does, I think, correctly interpret the severe hæmorrhage which is frequently found in association with either cirrhotic or œdematous ovaries without corpora lutea.

These cases are sometimes cured by curettage. Occasionally the exhibition of thyroid and iodine by the mouth seems to do good—the reason possibly being due to the capacity of thyroid and iodine for absorbing fibrous tissue.

Some authorities advocate deep x-rays or radium, which may or may not produce temporary amenorrhœa followed by a recurrence of hæmorrhage. Personally I prefer operative treatment, being disappointed by the many failures I have seen after radium and deep x-rays.

For instance, Mrs. M., aged 36, was treated by 9 sittings of deep x-rays in January and February 1931. She had total amenorrhœa till July when profuse hæmorrhage began again. I performed vaginal hysterectomy.

(2) Mrs. K. had radium in England in May 1930. In November the hæmorrhage began again. In January 1931 I did an abdominal hysterectomy.

The acute abdomen

Well has it been said that the barren field of the umbilicus is the Waterloo of every practitioner, for you will not be long in practice before you are called to a female patient with acute abdominal pain. It is therefore important that I loosen the anchors of your memory by reminding you of a few tests and physical signs, for apart from gall bladder, gastric or renal crises, the emergency catastrophes of women in India are many. For instance:—

(1) *Ruptured ectopic pregnancy* may occur without any preliminary pain or noticed menstrual disturbance, but apart from pain, collapse, or rigidity, the diagnosis is certain if the patient has acute pain in the supra-spinous fossa of either shoulder; such pain is, of course, due to blood percolating between the liver or spleen and diaphragm, and stretching the phrenic nerves. Moreover, you can make absolutely sure, if still in doubt, by inserting a speculum and passing the needle of a Record syringe into the pouch of Douglas. Free blood can only mean a ruptured ectopic gestation, or that rare condition, profuse hæmorrhage from an ovarian follicle.

(2) *Acute salpingitis or pelvic peritonitis* is not always of gonorrhœal origin; it may occur in patients whose social status makes such enquiry extremely difficult. Moreover in India you may be prevented from making a vaginal examination. Therefore remember that the pain and rigidity are usually below the umbilicus and bi-lateral and that the area of epicritic hyperæsthesia to the prick of a pin is of increasing intensity downwards from a line drawn joining the two anterior superior spines; and that if you pick up between your finger and thumb a portion of the skin and subcutaneous tissue and lift it off the abdominal muscle, below this line, you will find the same increasing hyperæsthesia.

(3) In rare cases *fulminating appendicitis* will give you difficulties in diagnosis from acute salpingitis, but in such a case these two tests are invariably on the right side only. A vagino-rectal examination will, of course, make clear any case of doubt. Acute appendicitis or so-called *appendicular colic* with fever in women is often diagnosed in India when the real cause is a leaking tubal gestation or a twisted ovarian cyst or a *B. coli* pyelitis. If the appendix is at fault you may obtain confirmation by Rovsing's sign, which is elicited by pressing on the pelvic colon in the left iliac fossa. This forces gas backwards into the cæcum giving rise to pain in the right iliac fossa, which is diagnostic of appendicitis. A retro-cæcal appendix, when inflamed, is very difficult to diagnose from pyelitis or even cholecystitis. In such a case Baldwin's test, if positive, is very useful. This test consists of pressing lightly with a finger on the most

tender spot in the flank and then asking the patient to lift her right leg off the bed keeping the knee stiff. If she complains of an increase in pain, or promptly drops the leg with a cry, the test is positive.

A vaginal or recto-vaginal examination should, of course, always be done to eliminate the possibility of an extra-uterine gestation or the presence of an ovarian tumour twisted or inflamed. The most frequent type of tumour to twist or inflame is, in my opinion, a dermoid.

On several occasions I have been asked to see women, who had attacks of right-sided colicky pain in the intervals between the 'periods' where no question of extra-uterine pregnancy existed. Most of these cases I am sure are due to a little excess of bleeding into the peritoneal cavity after rupture of a Graafian follicle between the 13th and 17th day after the commencement of the menstrual cycle. Moreover, many gynecologists must be aware of cases where in the course of a vaginal examination they have ruptured such a follicle; the effusion of fluid shortly giving rise to colicky pain in the abdomen.

(4) A *ruptured pyosalpinx* is one of the catastrophes of gynecology, for if the pus is not localized it may give rise to all the physical signs and appearances of general peritonitis, necessitating immediate laparotomy. On the other hand, if the pus is localized behind the uterus or between the uterus and the anterior abdominal wall, you will obtain, in the one case, confirmation by the passage of mucus from the anus (irritative diarrhœa), while, in the other, there will be strangury. An exploratory needle will make matters clear.

(5) *Pyelitis* is very common in India. The presence of pus cells and albumen in the urine of a patient with acute pain on the right side and fever should always make you think of *B. coli* bacilluria, especially if the patient is pregnant.

You will have noticed that I have not mentioned the matter of leucocytosis, important though it be, because when its diagnostic value would be greatest in the earlier stages it is rarely present, therefore you must depend most upon your clinical acumen, for remember the old saying 'Faith, Hope, and Charity, and the greatest of these is Charity'. Prognosis, diagnosis and treatment, and the greatest of these is diagnosis.

(6) Occasionally you will see cases of *acute abdominal pain in pregnancy*. First eliminate such things as twisting of a tumour, obstruction, worms, cholecystitis, appendicitis, or the cramps of tetany and osteomalacia.

Then concentrate on the discovery of a cause for a degree of toxæmia which may cause hæmorrhage into the wall of the uterus; so never fail to examine the urine properly, for the presence of Wright's 'H substance', derived from extravasated blood in endothelial tissues, always causes albuminuria and collapse.

(7) Every now and then you will be asked to see a patient who is known to have an *ovarian cyst* and who has refused operation. You are called because she has intense colicky pain. Don't necessarily rush into the diagnosis of torsion, but remember that one of the loculi may burst into the general peritoneal cavity causing intense irritation, the interesting feature of such an incident being that diagnosis is certain if almost immediately there is intense diuresis.

Spinal anæsthesia

In India the fear of chloroform anæsthesia is often shared by patient and surgeon alike, it is for this reason that post-graduates should know and practise the art of spinal anæsthesia, for since Pitkin's work has been confirmed by thousands of operations there is no reason for fear. Pitkin likens the behaviour of his solution of Spinocaine, on entering the thecal tube, to a bubble floating in a spirit level. Thus, with the spine horizontal paraplegia will be produced up to the segment of the cord opposite the level of injection, and by tilting the head of the table downwards, only the parts supplied by the lumbar thecal nerves are paralysed, whereas by tilting the head of the table upwards the paraplegia extends to the chest. Thus posture determines the distribution of the Spinocaine. In order to combat the drop in blood pressure and that alarming cold sweating that used to occur, we now inject hypodermically a solution of ephedrine and novocaine in the lumbar region, just before the spinal puncture. There are no difficulties in the method if you will but remember that when you raise the head of the table the neck and head of the patient must be acutely tilted downwards by placing a sand bag under the shoulders. I have used this method with great success at the Eden Hospital, whenever the general condition of the patient prohibited general anæsthesia; as, for instance, in a Cæsarean section on account of acute yellow atrophy of the liver, and in implantation of the ureters into the rectum in a debilitated patient.

Spackman of Bombay using the same technique with Percaine also reports enthusiastically on this method in 71 operation cases in the upper and lower abdomen, and there can be no question that the liability to lung complications, which so frequently jeopardises surgery of the upper abdomen in India, is greatly lessened by the use of Spinocaine or Percaine spinal anæsthesia.

I trust that many of you will try this method, for as Spackman says, and you all know, 'general anæsthesia in India affords more anxiety to the operator than to the patient'.

Pernoctan

This intravenous hypnotic is of particular value to gynaecologists in India, for fear of chloroform is almost as great amongst women as is that of operation.

For test purposes I used it in 50 consecutive cases in private practice and in hospital, giving the dosage prescribed per body-weight. It is cheap and allays all anxiety.

Chloroform should not be given with it and in major operations, such as hysterectomy, the quantity of ether given only amounted to 4 to 6 ounces, and this in the hot weather.

The patient sleeps for several hours after operation and awakes without pain, though morphia can be given, if necessary. There is no vomiting. The fact that the injection is given to the patient in her bed, without first removing her to the theatre or anæsthetic room, will appeal to all gynaecologists.

So far as my own experience goes I have but one regret and that is that Pernoctan is contra-indicated in patients with fever at the time of operation.

Inoperable cancer

Last year I referred to the medical treatment of those advanced cases of cancer which so frequently come before us in India, cases either of recurrence after operation or too late for surgical interference.

So long ago as the 16th century, lead was used by Ambroise Paré and, more recently, has been employed by Blair Bell, but with a considerable mortality.

For this reason selenium, in a colloid form combined with lead, was tried by Todd of Bristol (*vide The Lancet*, August 23, 1930) after many experiments, the idea being to develop the technique for hopeless cases as an addition to the present surgical and radiological treatment. The colloid is of low toxicity and is given by intravenous injections at weekly intervals, the size of the latter injection depending upon the amount of focal and general reaction. The reaction lasts for about 24 hours, and when this is over, the patient feels better, with an increased appetite and diminished pain. In sarcomata we increase the dose by 1 to 2 c.cm. per week and in epitheliomata by 2 to 4 c.cm.

Selenium is a stimulus to the defensive action of the tissue, around and about the cancer, for subsequent to treatment there is an increase of lymphocytes, plasma cells and eosinophiles in the blood, and a great hyperplasia of fibrous tissue.

In addition to the injection it is very important to insist that the patient shall take food substances rich in vitamins A and D, such as liver, milk, eggs, etc., daily, for we know that cancer tissue and the plasma of cancer patients show a poverty of calcium, proportional to the rapidity of the growth of the cancer.

For this reason Todd prescribes a drachm of calcium chloride a day and Radiostoleum or Irradol together with small doses of thyroid extract, as a tonic for the purpose of stimulating metabolism and immunizing processes; he

is of opinion that radium and deep x-rays should not be used while colloid treatment is being carried on, for if they are used the symptoms and tumour increase in magnitude.

When at Home recently I visited Dr. Todd and he very kindly showed me scores of cases under treatment, most of them desperate cases, sent to him from all over England by other surgeons. Having seen these cases, many of them alive for years, the tumours having sclerosed and shrivelled up, I feel we should give it a fair trial. I have many cases at present under treatment in our out-patient department. The colloid can be obtained—10 c.cm. for Rs. 3-12 in ampoules from Mr. Clark, agent for British Drug Houses Ltd., 27/4, Waterloo Street, Calcutta.

Inoperable vesico-vaginal fistulae

The operation of implantation of the ureters into the bowel is of considerable antiquity, and was first performed successfully for ectopia vesicae by Peters and Lendon in 1900. Since then the technique has been greatly improved and thanks to the work of Bond, Stiles, Mayo, Grey-Turner and Coffey, the indications for this operation have multiplied, genito-urinary surgeons using it in cases of cancer of the bladder, or prostate, ectopia vesicae and multiple perineal fistulae; while gynaecologists employ it for inaccessible and inoperable vesico-vaginal fistulae, for although such cases may be rare in the West, in the tropics, as a result of crippling osteomalacic deformity, or obstetric complications, where indifferent medical aid was available, it is no uncommon thing to see cases where cartilaginous scar tissue makes up the floor of the pelvis throughout which the upper wall of the bladder prolapses. In other cases scar tissue or bony deformity, due to falling in of the rami of the pubes, permits only the passage of one finger into the vagina, at the top of which the soft mucous membrane of the bladder can be left.

The condition of these patients, often only in their teens, is pitiable. For this reason many of us have tried out every known operation for fistula, and only within recent years have we arrived at any satisfactory conclusion, and that is implantation of the ureters into the bowel. But unless the set of the operation was perfectible surgeons have been deterred from carrying it out because of the initial cost and difficulties in the technique of Coffey's operation.

For this reason I have striven, during the last few years, to devise a technique easy and palatable to all surgeons wherever situated, the strategy being that of Coffey, namely, the formation of a gutter and valve-like mechanism in the bowel wall, as opposed to a sphincter, the tactics being that of simplicity, doing a one- or two-stage operation according to the general health of the patient.

Briefly stated I pass a flute-ended ureteric catheter up the ureter, and then, after inserting a 10-inch silver tube through the hole in the gut down to the anus, I pass the proximal end of the catheter through this tube. The silver tube is then removed by an assistant. The catheter-containing ureter is then laid in the bowel gutter and sewn over, following the method of Coffey. An illustrated account, in detail, will be published later. The advantages of this method are:—

(1) Simplicity.

(2) One or both ureters can be implanted at one sitting.

(3) Owing to the fact that a catheter is in the ureter there is no likelihood of an inflammatory exudate compressing the ureter in the bowel gutter and so giving rise to surgical uræmia.

THE USES OF MUSTARD IN MEDICINE

BY A CORRESPONDENT*

For many years the value of mustard and its preparations in the treatment of disease has been recognised, and it would be difficult to find a reputable work on medical treatment which does not contain favourable references to the mustard bath, pack and poultice, etc. As such references, however, are scattered throughout the large field of medical literature, and as fresh suggestions for the therapeutic uses of mustard are frequently being published, there seems reason to believe that an article in which the known medical applications of mustard are collated may be of value to the prescriber.

It is generally asserted that all the physiological effects of mustard are due to the presence of the volatile oil contained in black mustard seeds, and liberated when they are moistened with water. This statement is no doubt true in its essentials, but since practically no work has been carried out on the non-volatile oil of *white* mustard, and since the mustard flour of commerce is usually prepared from both varieties of seed, it is clear that it is inadvisable to be too dogmatic in explaining the physiological effects of mustard as a whole.

For the present, however, it is necessary to confine this article to volatile oil of mustard, the *oleum sinapis* volatile of the *British Pharmacopæia*. When crushed black mustard seed, or the flour therefrom, is moistened with cold or warm water, this volatile oil is rapidly evolved, being formed by the interaction of an enzyme, myrosin, with an organic compound known as sinigrin, which belongs to the group of glucosides so widely distributed in the vegetable kingdom. Myrosin, like other enzymes, is destroyed by heat, so that when mustard is added to hot water no volatile oil is formed. A temperature of about 60°C. (140°F.) is sufficient to destroy the enzyme completely, but even at lower temperatures than this the evolution of volatile oil is impaired.

The primary action of mustard oil upon the skin is to cause a dilation of the capillaries, yielding a sense of warmth and a 'tingling' sensation, pleasant at first, but rapidly becoming unbearable. A red flush is seen at the site of application, followed eventually by a wheal, similar to that produced by a burn. The physiology of these changes is very fully dealt with by Sir Thomas Lewis. His researches have proved that skin

* Since we sent this article to press it has appeared in the same form in the *Medical Journal of South Africa* to which journal we now make acknowledgment.—
EDITOR, I. M. G.

stimulation of all kinds, whether due to heat, chemical agents or trauma, causes the liberation of a substance named by him H-compound, whose action on the capillaries causes the phenomena described above.

Therapeutically, these primary actions of mustard have valuable direct uses. The mere sensation of warmth produced is utilised in the treatment of many ailments of the kind typified by the common cold. The mustard bath or mustard foot-bath causes a sensation of warmth which not only is pleasant and soothing to the patient's feelings, but provides the body with the optimum conditions demanded for combating the invading organisms. Arising out of the rubefacient action, a strong diaphoretic effect is obtained, which is utilised by the prescriber who wishes to produce copious sweating, as in febrile ailments.

The treatment suggested for an oncoming cold, or a sensation of chill, will therefore be as follows. A hot mustard bath should be taken, containing 1 ounce of mustard per gallon of water, the mustard being mixed with tepid water five minutes before being added to the bath; failing this a mustard foot-bath, followed by a hot drink of milk, gruel, etc., and an immediate retirement to bed, accompanied by a hot water bottle.

If the physiology of the mustard application be further considered, fresh fields of use come into view. The dilatation of the capillary walls by the H-substance, called forth through the stimulus of the mustard, increases the flow of blood to the surface of the body from the organs lying beneath. This is the action of all counter-irritants, and mustard oil is the counter-irritant most generally valued by the prescriber, having nearly as much vigour as cantharides, while being easier of control and of wider application.

Counter-irritant action itself falls into several categories, but in the present survey it may suffice to mention a few of the chief aspects.

Congestion of all kinds is at the basis of many diseases of the internal organs. Application of a mustard poultice or plaster to the body immediately above the affected organ causes speedy relief and frequently prevents the engorged vessels from suffering permanent damage. A mustard poultice is prepared by mixing equal parts of mustard flour and either linseed meal or ordinary flour. If a weaker poultice is desired the proportion of mustard should be lessened. In any case, the mustard should be mixed with tepid or cold water several minutes before the hot water is added.

For a mustard pack, a piece of flannel or calico, folded 6 or 8 times, is soaked in mustard and hot water, wrung out and applied while hot.

In pleurisy, pneumonia and bronchitis, a similar use of mustard poultices, etc., is recommended by most authorities as affording relief from the feeling of 'tightness' and pain common to all respiratory diseases, as well as producing an increased flow of blood that assists in removing the accumulation of pus, bacteria, etc. This leads to a consideration of a further general use of mustard, namely, the relief of inflammatory disorders. The formation of toxic products in any part of the body demands their prompt removal if permanent local injury is not to result. This is considerably assisted by an application of mustard to the skin as near to the site of infection as is convenient. A field of disease which comes under consideration in this connection is that of rheumatic disorders, including lumbago and sciatica. Though definite distinctions exist between the various diseases of this type, they are mostly characterised by continued pain due to inflammation, swelling, etc., in the joints of the limbs and similar convenient sites for the accumulation of toxins. The relief afforded by the counter-irritation of a mustard preparation is well known, and with the present widely-increased interest in the treatment of rheumatism, particularly the dangerous rheumatism of childhood, it may be anticipated that mustard baths will play a large part in the hydrotherapeutic treatment already so popular for these complaints.

There is still another purely physiological action of mustard to which reference must be made. When the

counter-irritant effect comes into play, and the dilatation of the capillaries is drawing blood from the organs beneath, a reflex nervous stimulus is produced, acting on the heart and respiratory organs. This may be one of Nature's protective mechanisms, designed to prevent the ill-effects on the heart of too sudden removal of blood to the capillaries, a dangerous condition typified in 'wound shock'.

Whatever the theory, in practice this stimulating action proves most valuable. A body weakened by continued pain, to which a mustard preparation is applied, receives not only relief in the manner above described, but also a definite tonic effect which tends to restore vigour. In other words, the value of mustard as an analgesic is enhanced by its action as a reflex stimulant.

The foregoing will have indicated generally the maladies for which mustard can be claimed to have a remedial or alleviating effect. Febrile disorders as a whole, and most inflammatory conditions, are benefited by mustard applied either locally, as a pack, plaster or poultice, or generally as a bath. Mustard is therefore recommended by medical authorities for all the diseases of the respiratory system, the various forms of pneumonia and bronchitis, pleurisy, etc., and for the milder catarrhs prevalent in a British climate.

Rheumatic disorders may be considered under the heading of inflammation, since though there may be disagreement as to the ætiology of some of the many diseases of this nature, authorities are united on the efficacy of mustard in relieving the pain characteristic of them all.

The counter-irritant action of mustard in alleviating congestion of the lungs, liver or brain has been referred to. The convenience of the mustard poultice is here a strong recommendation, compared with the drastic early remedies such as cupping and leeches.

Allied to this use of mustard are two which are to be found frequently in the literature; the hip-bath, to soothe menstrual pains and also induce delayed menstruation.

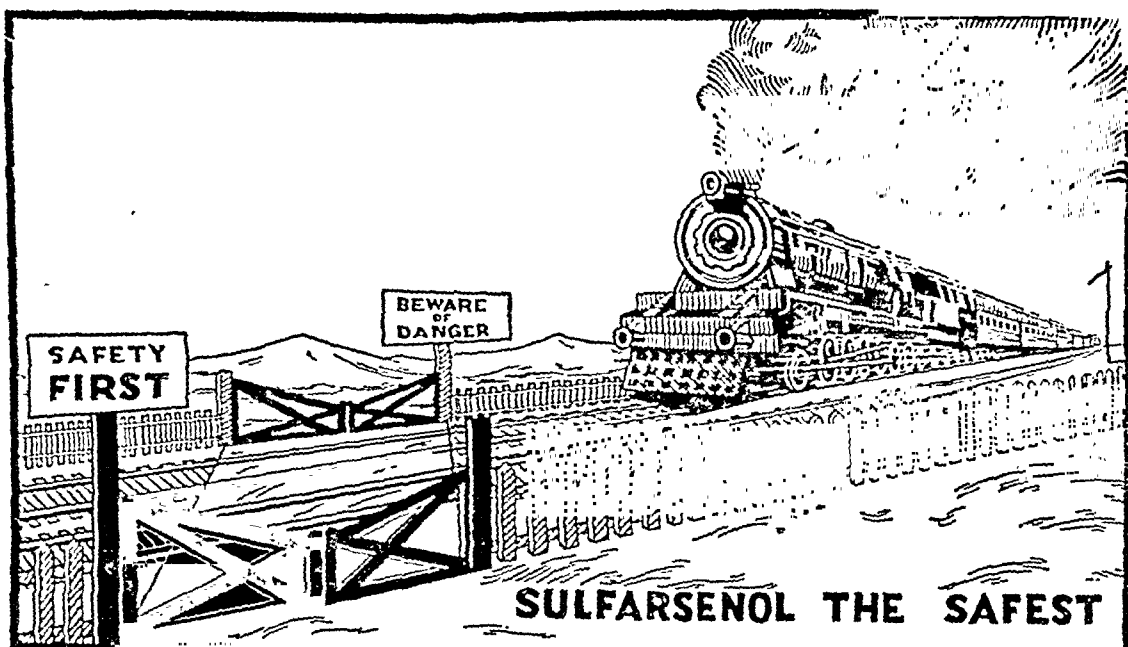
An application of the stimulating effect of mustard is in curing alopecia, or irregular and premature baldness. Though as yet this matter has not been completely investigated, it is clear that an increased stimulation of the capillaries serving the hair roots will increase the nourishment of the latter, to their undoubted advantage.

Ringer and Sainsbury and others recommend a mustard bath in eruptive fevers, where there is a recession of the rash, to bring it back to the skin. Various pediatricians favour a hot mustard bath for the treatment of infantile convulsions, and other uses of mustard in children's disorders include the mustard bath for general collapse, or sudden congestion of the heart or brain, or as a large poultice in heart failure.

Though the irritant action of mustard is usually a contra-indication in diseases of the skin, Hetherington recommends mustard baths for the treatment of acne and pustular diseases. This is, of course, in accordance with the generally-accepted use of frequent hot water applications to render the skin soft and hasten the elimination of the pustules.

Although this article has been primarily devoted to a consideration of the numerous applications of mustard applied externally, its well-known emetic action must receive mention. Used in the proportion of one tablespoonful of mustard in half a pint of warm water, mustard forms a powerful emetic. The reflex stimulant action referred to earlier has considerable value in this connection, counteracting the depressing effect which is associated with the use of most emetics, and causing it to be particularly recommended in narcotic poisonings. Its use is, of course, strictly to be avoided in poisoning by corrosive agents.

While the above article does not claim to cover all the applications of mustard which are met with in the wide literature of medical treatment, enough has been said to indicate the general conditions in which 'mustard therapy' is of proved value.



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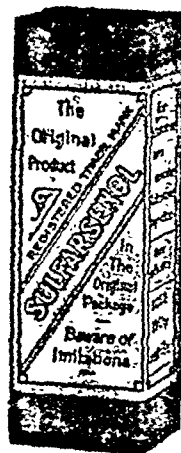
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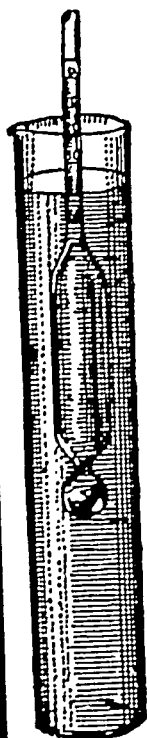
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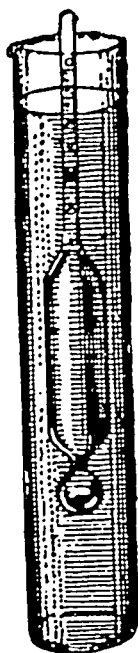
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Indian Medical Gazette

JANUARY

THE REPORT OF THE DRUGS ENQUIRY COMMITTEE

WITH the genesis of the Drugs Enquiry Committee most of our readers are familiar. For many years we have drawn attention to the necessity for an enquiry into the question of the control of the manufacture and importation of drugs in India, and in our July 1929 number we discussed the various points at some length in an editorial which we notice has been quoted *in extenso* in the report of this Committee. In a more recent editorial (November, 1930) we gave details of the formation of this Committee, its terms of reference and its composition, but it will perhaps not be out of place to repeat these again here; they were:—

(1) To enquire into the extent to which drugs and chemicals of impure quality or defective strength, particularly those recognized by the British Pharmacopoeia, are imported, manufactured or sold in British India, and the necessity, in the public interest, of controlling such importation, manufacture and sale, and to make recommendations;

(2) To report how far the recommendations made in (1) may be extended to known and approved medicinal preparations other than those referred to above, and to medicines made from indigenous drugs and chemicals; and

(3) To enquire into the necessity of legislation to restrict the profession of pharmacy to duly qualified persons, and to make recommendations.

Lieut.-Col. R. N. Chopra, I.M.S., Professor of Pharmacology, Calcutta School of Tropical Medicine and Hygiene, was Chairman; there were three members, Rev. Fr. J. F. Caius, S.J., Pharmacologist at the Haffkine Institute, Bombay, Mr. H. Cooper, Ph.C., F.C.S., of Messrs. Smith Stanistreet & Co., Ltd., Manufacturing Chemists, Calcutta, and Maulvi Abdul Matin Chaudhury, M.L.A., and a secretary, Mr. C. Govindan Nayar, B.A., B.L., Barrister-at-Law, of the Madras Judicial Service.

The Committee, who had previously issued a questionnaire and called for written evidence, commenced to hold their sittings and to examine witnesses on the 17th October, 1930, in Madras; they subsequently visited the United Provinces, the Punjab, Bengal, the North-West Frontier Province, Bihar and Orissa, the Central Provinces, Bombay and Delhi, and on March 29th, 1931, they presented their report. We must congratulate the Committee, and particularly their Chairman who at an early stage of the proceedings suffered a severe illness and was throughout the rest of the period battling

against ill-health, on carrying out their work so thoroughly and with such expedition.

The necessity for an enquiry of this nature is a matter that we need not go into again. In India to-day there is practically no legislation which prevents or controls the importation or manufacture and sale of spurious and even dangerous drugs. Such legislation as exists is associated with excise and customs and is designed to protect the coffers of the State rather than the health of the individual. Under the Penal Code prosecution for fraud can in certain cases be instituted, but the lack of definite standards makes conviction difficult and discourages any attempts at enforcement. The problem, as far as it is applicable to drugs, divides itself naturally into two portions, that applicable to imported drugs and that applicable to Indian-manufactured drugs. The import trade in drugs has undergone very rapid development during recent years, from 41 lakhs in 1908-9 to 202 lakhs in 1928-9, and whereas some few years ago the principal suppliers were reputable British, American, and Continental manufacturers, the rapidly increasing demand and the absence of any legal control have attracted the attention of the riff-raff of the trade who are now pouring into the country cheap, adulterated, inactive and even dangerous drugs; within the country there is no shortage of opportunists willing to turn a dishonest penny, and the bogus drug manufacturers have done far more to check honest enterprise in the indigenous industry than has foreign competition.

There was no lack of evidence regarding the dilution and adulteration, the impurity, the therapeutic inactivity and the deliberate misbranding of a large proportion of the drugs imported into and made in this country; but, in order not to be biased by the evidence of others only, the Committee collected a number of samples and had them analysed. The results of these analyses showed that the statements of witnesses had not been exaggerated. Let us take for example the case of quinine:—Quinine is a drug which is above all others the most vitally important to India; we can think of no more despicable act than the selling to a malaria-stricken peasant as 'quinine' a tablet containing nothing but chalk or some such inactive substance, yet the three samples, all of Indian origin, analysed under the direct supervision of the Committee contained no quinine at all, and in a table giving the results of analyses by witnesses we see that of 51 samples of quinine tablets 10 contained a negligible quantity of the alkaloid. The origin of about half these samples is given as 'unknown', but 10 are labelled specifically as coming from Great Britain, 9 from Germany, and 6 from India. In 13 of the 19 imported samples quinine is in a negligible degree in excess or deficiency, in 4 the quinine is about 10 per cent. deficient, and

in the remaining two it is 20 per cent. and 16 per cent. deficient, respectively; of the 6 Indian samples, in one quinine is almost up to the correct weight, in three others it is 11 per cent., 20 per cent., and 44 per cent., respectively, deficient, and of the remaining two samples, one contained no quinine at all, and the other only a trace. If these are fair samples of quinine tablets on the market, it is quite obvious that the most serious adulteration is going on *within* the country, a point which the Committee did not emphasize.

The Committee seem to have laid considerable emphasis on the question of patent and proprietary medicines. From the evidence they obtained it is very obvious that the consumption of these is increasing year by year to an alarming extent; the trade returns show that in the year 1928-29 there was an increase of 44 per cent. over the importations of the previous year. The Committee, both in their discussion and in their recommendations, were very careful to distinguish between secret nostras and scientifically-conceived drugs which are given proprietary names. In the minds of many of the witnesses there was obviously much confusion on this point; for example, one senior officer said, 'the proprietary medicines and other allied rubbish that are poured into this country.....are increasing year by year'. Does he, we wonder, realise that Salvarsan, Plasmochin, and even Aspirin and Urotropin are proprietary drugs? That the trade in secret and extensively-advertised remedies does a great deal of harm, that the law of the land does little to discourage the most palpable frauds in this respect, and that it is the class that can least afford it which are the most ready victims, is only too true: the difficulty is to devise legislation to prevent it. In England, in the United States and in other countries the evil is only mitigated and not removed despite considerable legislation. The Committee wisely confine themselves to drawing attention to the evil, and refrain from endorsing the sweeping suggestions made by some of the witnesses. After reading a badly-needed lecture to the medical profession on the subject of 'proprietary' prescribing, they make some useful recommendations regarding the labelling of patent and proprietary drugs, false and misleading advertisements, the prohibition of narcotics in these drugs (but not their total prohibition in prescriptions as has been implied in some of the reports in the lay press), and finally suggest an *additional* import duty of 20 per cent., and a corresponding excise duty, on all patent medicines with undisclosed formulæ.

The problem of proprietary drugs of known formula is intimately associated with the whole problem of drug control; in a country where, for example, any rubbish may be sold as acetylsalicylic acid, it is not surprising that doctors and patients prefer to pay more for

Aspirin and thereby to know what they are getting. We are glad that the Committee did not recommend any special duty on useful drugs of this nature.

The question of the inclusion or otherwise of drugs used by the practitioners of the indigenous systems of medicine, the Vaidyas and the Hakeems, was next investigated. The first point that arose was whether these drugs *were* adulterated to any extent. A few witnesses, apparently on the grounds of logic rather than actual experience, said that there was little adulteration and that, as these drugs were cheap, the temptation to adulterate them was less; but from the evidence of the large majority of the witnesses it was apparent that, even if the temptation was small, the opportunity to carry out wholesale adulteration and even substitution without any risk of detection was so great that the state of affairs in the indigenous-drugs trade was far worse than that of the drugs of the Western system. So bad are matters that some of the practitioners of the indigenous systems are reported to be substituting certain 'Western' drugs, on which they can rely, in their prescriptions. The Bombay Medical Union in a burst of nationalist enthusiasm considered that, as the vast majority of India's population used only the indigenous systems, the Committee would not be doing their duty unless they included these drugs in any control which was recommended, but they failed to make any suggestion as to how this could be done. The more the Committee probed into the matter the more obvious it became how utterly impossible it would be to introduce any scientific control where there were no pharmacopœia, no standards, and no certainty as to the identity of many of the plants used in the indigenous systems. In this matter the Committee, obtaining no help from any of the practitioners of scientific medicine, turned to the indigenous practitioners. Some opposed interference on religious grounds, the majority agreed that control was desirable and even urgently required, but could give no indication how this was to be exerted, and, finally, one witness suggested that it ought to be possible by testing certain physical characters of the drugs to determine whether they were genuine or not. This tentative and indefinite suggestion was the only encouragement the Committee got, and they were driven to the conclusion that the first step to be taken was for kavirajs to put their own house in order; for this the suggestions brought forward by various witnesses can be summarised as follows:—Their drugs should be standardised and a type collection made; systematic cultivation of plants should be undertaken; schools should be started; and only qualified and licensed practitioners, herb dealers, and dispensers should be allowed to practise their various arts. All these suggestions were outside the scope of the Committee's terms of reference. With regard to

drugs of the indigenous systems the conclusions at which they arrived were that there was considerable adulteration of these, that such adulteration was undesirable and should be controlled, that in the absence of standards, etc. control, on the lines exercised in the scientific systems, was quite impossible, and that, until such time as their practitioners organised the various indigenous systems, the drugs used only in these systems should not be included in any legislation applicable to the drugs used in scientific medicine.

Ninety-five per cent. of the arguments one hears in favour of the indigenous systems as against the scientific system of medicine are on the grounds that the ryot cannot afford anything better; by the time the control suggested above has been brought into force, the services of the indigenous practitioners will be quite as expensive as those of the practitioners of the scientific systems, but is there any guarantee that they will be as valuable?

The general recommendations made by the Committee were extremely comprehensive, and it is difficult to summarise them, but the important points were as follows:—

Legislation to control drugs is desirable and should include drugs of the British Pharmacopœia and other approved medicinal preparations, whether indigenous or otherwise. This legislation should be central, and should not be combined with that for the control of food, which is essentially a provincial matter. A central laboratory should be established and should be located in either Bombay or Calcutta. There should be in each province local testing laboratories in charge of a public analyst; the functions of the provincial laboratories should be to analyse and report on drugs, imported or made locally—other than biological and organo-metallic compounds—which are submitted to them by the local authorities or by manufacturers, in the latter case the analysis should be done on payment. The functions of the central laboratory should be to maintain stable standards of purity and quality for drugs, to standardise methods of analysis for the different climatic conditions prevailing in various parts of India, to assay biological products and organo-metallic compounds for the authorities and for private individuals, for the latter on payment, to train public analysts, to co-ordinate and supplement the work of the provincial laboratories, and finally to carry out research work on indigenous drugs. In order to assist the Governor-General in Council in framing, adjusting and maintaining the regulations for the control of drugs an Advisory Board should be formed. All manufacturers, importers and retailers of drugs, and all places where drugs are manufactured or sold, should be registered. Government inspectors should visit all places where drugs are made or kept, and they should have full powers to seize any drug they suspect to be misbranded or adulterated; the

manufacture, sale, or storage of drugs which are subsequently found on analysis at the provincial or central laboratories to be misbranded, adulterated or in any way unwholesome should be a punishable offence, *bona fide* purchase and sale in the same condition being recognised as a good defence. In the case of organo-metallic compounds (*e.g.*, the pentavalent antimony compounds) a sample from each lot manufactured must be submitted to the central laboratory. In the case of imported drugs the inspection should be undertaken by the customs officials; after notification to the consignee samples of drugs should be taken and submitted for analysis; pending analysis the consignment might be detained or be delivered on special conditions, but in the case of biological products and organo-metallic compounds the consignment should not be delivered prior to analysis of the sample.

The financial aspect of the recommendations the Committee did not feel that they were able to investigate in any detail; they admit that the establishment of the central and provincial laboratories and the provision of inspectors will cost money, but they point out that their proposals involve the payment of fees for registration and licensing, and for the testing of samples, a 5 per cent. increase in the duty on all drugs and chemicals (with the exception of crude drugs not available in India), and an additional 20 per cent. duty on all patent medicines with undisclosed formulæ. In time the whole scheme should be self-supporting. In addition to this there is the improvement in the health of the people of India which would be a very real gain, but one which cannot be assessed in terms of money.

There were other important matters such as the profession of pharmacy, quinine policy, the Medical Stores Department, and the preparation of an Indian Pharmacopœia which the Committee investigated and on which they made recommendations; we shall deal with these at a later date.

The Committee have produced a well-balanced and entirely unprejudiced report. All branches of the medical profession, both official and non-official, chemists, pharmacists and the various interests in the drug trade were represented amongst the witnesses. Making allowances for the different aspects from which the witnesses viewed the situation, there was an almost unanimous expression of opinion as to the necessity of control. As to the way that should be exercised opinions were divers but not really divergent, and we firmly believe that the recommendations put forward by the Committee cannot be said to run counter to any one of the interests represented. That their object is to strike a blow at dishonest traders and that opposition from this quarter may be expected is obvious, but the real dangers to the acceptance of these recommendations by Government are the indifference of

the legislature to problems of this nature and the present financial stringency. The Finance Department do not want to hear anything about what will happen in a few years' time; they will ask where is the money to come from *now*. However, we sincerely hope that this will not stand in the way of some early action being taken on these recommendations, even if the full scheme cannot be contemplated for some years.

Once more we congratulate the Committee on their excellent report.

Medical News

THE ALL-INDIA MEDICAL COUNCIL BILL

As our readers know, the question of the creation of an All-India Medical Council of Registration has been under the consideration of Government for a number of years. The suggested draft of the Bill has now been framed and issued. As many of our readers will be interested in the matter we here reproduce (a) the text of the Bill itself; and (b) abstracts from a covering letter from the Government of India, Education, Health and Lands Department to Local Governments and Administrations dealing with the Bill.

A BILL TO ESTABLISH A MEDICAL COUNCIL IN INDIA AND TO PROVIDE FOR THE MAINTENANCE OF A BRITISH INDIAN MEDICAL REGISTER

Whereas it is expedient to establish a Medical Council in India and to provide for the maintenance of a Register of qualified practitioners of modern scientific medicine in order to establish a uniform minimum standard of qualifications in medicine for all provinces such that persons attaining thereto shall be acceptable as medical practitioners throughout British India; It is hereby enacted as follows:—

Short title, extent and commencement

1. (1) This Act may be called the Indian Medical Council Act, 193 .
- (2) It extends to the whole of British India.
- (3) It shall come into force on such date as the Governor-General in Council may, by notification in the Gazette of India, appoint.

Definitions

2. In this Act, unless there is anything repugnant in the subject or context,—
 - (a) 'British Indian University' means any university in British India established by an Act of the Indian Legislature or of a local Legislature and having a medical faculty;
 - (b) 'the Council' means the Medical Council of India constituted under this Act;
 - (c) 'medical institution' means any institution, within or without British India, which grants degrees, diplomas or licenses in medicine;
 - (d) 'medicine' means modern scientific medicine and includes surgery and obstetrics, but does not include veterinary medicine and surgery;
 - (e) 'Provincial Medical Council' means a medical council constituted under an Act of a local Legislature to regulate the registration of medical practitioners;
 - (f) 'Provincial Medical Register' means a register maintained under an Act of a local Legislature to regulate the registration of medical practitioners;
 - (g) 'the Register' means the British Indian Medical Register of medical practitioners maintained under this Act; and
 - (h) 'Regulation' means a regulation made under section 23.

Constitution and composition of the Council

3. (1) The Governor-General in Council shall cause to be constituted a Council consisting of the following members, namely:—

- (a) the President, who shall be nominated by the Governor-General in Council;
 - (b) one member from each Governor's province, to be nominated by the Local Government of the province;
 - (c) one member from each Governor's province, to be elected from amongst themselves by the members of the Medical Faculties of British Indian Universities within the province;
 - (d) one member from each province in which a Provincial Medical Register is maintained, elected from amongst themselves by persons enrolled on such register who hold qualifications in medicine granted or recognised by any British Indian University, or by any other medical institution which the Governor-General in Council may specify in this behalf; and
 - (e) three members to be nominated by the Governor-General in Council.
- (2) No act done by the Council shall be questioned on the ground merely of the existence of any vacancy in, or any defect in the constitution of, the Council.

Constitution and composition of the Council

3A.* (1) The Governor-General in Council shall cause to be constituted a Council consisting of the following members, namely:—

- (a)† the President, who shall be nominated by the Governor-General in Council;
 - (b) one member from each Governor's province, to be nominated by the Local Government of the province;
 - (c) one member from each British Indian University, to be elected from amongst themselves by the members of the medical faculty of such university;
 - (d) one member from each Provincial Committee of the Council as constituted under section 11, to be elected from amongst themselves by the members of such committees;
 - (e) three members to be nominated by the Governor-General in Council.
- (2) The President of the Council shall be elected by the members of the Council from amongst themselves: Provided that for five years from the first constitution of the Council, the President shall be a person nominated by the Governor-General in Council who shall hold office at the pleasure of the Governor-General in Council, and, where he is not already a member, shall be a member of the Council in addition to the members prescribed in sub-section (1).

Mode of election

4. (1) An election under clause (c) of sub-section (1) of section 3 shall be conducted by the Local Government, and under clause (d) of sub-section (1) of section 3 by the registrar of the Provincial Medical Register concerned, in such manner as it or he may think fit, subject to any instructions the Governor-General in Council may issue in this behalf.
- (2) Where any dispute arises regarding any election to the Council, it shall be referred to the Governor-General in Council whose decision shall be final.

Restrictions of nominations and elections

5. (1) Save as regards the Council as first constituted under this Act, no person shall be eligible for nomination or election under clause (b), (c) or (d) of sub-section (1) of section 3 unless he is enrolled on the Register.
- (2) No person shall be eligible for nomination under clause (b) of sub-section (1) of section 3 unless he resides in the province concerned, and, where a Provincial Medical Register is maintained in that province, unless he is enrolled on that register.

* Alternative proposals to clause 3.

† If sub-clause (2) is adopted, clause (a) will be deleted.

(5)* No person shall be eligible for election under clause (d) of sub-section (1) of section 3 unless he has had five or more years' experience as a Professor, Assistant Professor, Lecturer or Reader in the medical colleges or schools affiliated to British Indian Universities.

(4) No person may at the same time serve as a member in more than one capacity.

Incorporation of the Council

6. The Council so constituted shall be a body corporate by the name of the Medical Council of India, having perpetual succession and a common seal, with power to acquire and hold property both moveable and immoveable, and to contract, and shall by the said name sue and be sued.

Term of office

7. (1) The President shall hold office at the pleasure of the Governor-General in Council, and any other member shall hold office for the term of five years from the date of his nomination or election or until his successor shall have been duly nominated or elected, whichever is longer.

(2) Where the said term of five years is about to expire in respect of any member, his successor may be nominated or elected at any time within three months before the said term expires, but shall not assume office until the said term has expired.

Term of office

7A.† (1) A member, other than a nominated President, shall hold office for the term of five years from the date of his nomination or election, or until his successor shall have been duly nominated or elected, whichever is longer.

(2) An elected President shall hold office for a term not exceeding five years and not extending beyond the expiry of the term for which he has been nominated or elected a member of the Council.

Meetings of the Council

8. (1) The Council shall hold its first meeting at such time and place as may be appointed by the Governor-General in Council; and, thereafter, the Council shall meet at least once in each year at such time and place as may be appointed by the Council.

(2) Until otherwise provided by Regulations, ten members of the Council shall form a quorum, and all the acts of the Council shall be decided by a majority of the members present and voting.

Officers, Committees and servants of the Council

9. The Council shall—

(a) elect from amongst its members a Vice-President;

(b) constitute from amongst its members an Executive Committee, and such other Committees for general or special purposes as the Council deems necessary to carry out the purposes of this Act;

(c) appoint a Registrar, who may also, if deemed expedient, act as Secretary and Treasurer;

(d) appoint or nominate such other officers and servants as the Council deems necessary to carry out the purposes of this Act;

(e) require and take from the Registrar, or from any other officer or servant, such security for the due performance of his duties as the Council deems necessary; and

(f) with the previous sanction of the Governor-General in Council, fix the remuneration and allowances to be paid to the President, Vice-President, members, officers and servants of the Council.

*The sub-clause does not apply to alternative clause 3A (1) (d).

† Alternative proposals to clause 7 (1).

The Executive Committee

10. (1) The Executive Committee shall consist of seven members, of whom five shall be elected by the Council from amongst its members.

(2) The President and Vice-President of the Council shall be members *ex-officio* of the Executive Committee, and shall be President and Vice-President, respectively, of that Committee.

(3) In addition to the powers and duties conferred and imposed upon it by this Act, the Executive Committee shall exercise and discharge such powers and duties as the Council may confer or impose upon it by any Regulations which may be made in this behalf.

Provincial Committees

11. (1) In any province in which a Provincial Medical Council is constituted, the members of the Provincial Medical Council who possess recognised medical qualifications shall form a Provincial Committee of the Council for that province.

(2) The Registrar of a Provincial Medical Council shall be the Secretary of the Provincial Committee of the Council formed from such Provincial Medical Council.

(3) In addition to the powers and duties conferred and imposed upon it by this Act, a Provincial Committee shall exercise and discharge such powers and duties as the Council may confer and impose upon it by any Regulations which may be made in this behalf.

The Registrar

12. The Registrar shall, subject to the control of the Council, maintain the British Indian Medical Register, and shall exercise and discharge such other powers and duties as the Council may confer or impose upon him by any Regulations which may be made in this behalf.

Procedure for enrolment

13. (1) Applications for enrolment or for the amendment of any entry in the Register shall be made to the Secretary of the Provincial Committee of the province in which the applicant for the time being resides, and shall be disposed of by the Provincial Committee in accordance with this Act and the Regulations:

Provided that where the applicant resides for the time being in a province for which a Provincial Medical Council has not been constituted, the application shall be made to the Registrar and shall be disposed of by him in the aforesaid manner:

Provided further that where an applicant has not received orders on his application for a space of three months after he has made it, he may apply to the Council for enrolment, and the Council may take such action on his application as it may think fit.

(2) Any person aggrieved by an order of a Provincial Committee or of the Registrar under sub-section (1) may appeal to the Council.

Qualifications for enrolment

14. Any person holding a recognised medical qualification may apply for enrolment, and, if he complies with the Regulations made under clause (h) of sub-section (1) of section 23, shall be enrolled on the Register.

Erasure of names of persons guilty of improper conduct

15. (1) If it appears to a Provincial Committee of the Council that there is reasonable ground to believe that any person enrolled on the Register and residing in the province for which such Committee is constituted has been convicted, either in His Majesty's possessions or elsewhere, of a criminal offence implying a defect of character which unfits him to be a medical practitioner, or that he has been guilty of conduct improper to a medical practitioner, whether such offence or improper conduct has been committed before or after the enrolment of such person, or that he has been deprived of his recognised medical qualifications by the medical institution which granted them, the Committee may,

after three months' notice served personally or sent by registered post to the last known address of such person, hear and consider the matter, and, if satisfied that such person has been so convicted or has been guilty of such improper conduct or has been so deprived, shall make a report to that effect to the Registrar, who shall erase the name of such person from the Register:

Provided that—

(i) where a person enrolled on the Register has been enrolled on a Provincial Medical Register, and his enrolment has been cancelled for any of the causes aforesaid by the authority of the Provincial Medical Council of the province concerned, the Provincial Committee concerned shall, without further inquiry, report such cancellation to the Registrar who shall erase the name of such person from the Register;

(ii) in the case of a person enrolled on the Register and not residing in any province for which a Provincial Committee has been constituted, the powers and duties conferred or imposed upon the Provincial Committee by this sub-section shall be exercised and discharged by the Council.

(2) A person whose name has been erased from the Register in pursuance of a report of a Provincial Committee under sub-section (1) may appeal to the Council against the erasure.

(3) The name of a person shall not be erased under this section by reason only of his adopting or refraining from adopting the practice of any particular theory of medicine or surgery.

Re-enrolment after erasure from the Register

16. (1) A person whose name has been erased from the Register in pursuance of a report of a Provincial Committee under sub-section (1) of section 15 may apply to such Committee for re-enrolment on the Register, and the Committee shall dispose of the application in accordance with any Regulations which may be made in this behalf.

(2) A person whose name has been erased from the Register by order of the Council under proviso (ii) to sub-section (1) of section 15, may apply to the Council for re-enrolment, and the Council may take such action on his application as it may think fit.

Other amendments of the Register

17. (1) Any entry in the Register may be cancelled or amended at any time, by order of the Council, upon the ground of fraud or mistake.

(2) The Council may make Regulations empowering the Registrar to erase from the Register the name of any person with whom he is unable to establish communication.

Recognition of medical qualifications granted by medical institutions in British India

18. (1) The medical qualifications granted by medical institutions in British India which are included in the First Schedule shall be recognised medical qualifications for the purposes of this Act.

(2) The medical institutions in British India which grant a medical qualification not included in the First Schedule may apply to the Governor-General in Council to have such qualifications recognised, and the Governor-General in Council, after consulting the Council, may, by notification in the Gazette of India, amend the First Schedule so as to include such qualification therein.

(3) Such notification may also direct that an entry shall be made in the last column of the First Schedule against such medical qualification declaring that it shall be a recognised medical qualification only when granted after a specified date.

Recognition of medical qualifications granted by medical institutions outside British India

19. (1) The medical qualifications granted by medical institutions outside British India which are included in the Second Schedule shall be recognised medical qualifications for the purposes of this Act.

(2) The Council shall have power to arrange schemes of reciprocity as to the enrolment and registration of medical practitioners with the authority in any State or country outside British India which by the law of such State or country is entrusted with the maintenance of a register of medical practitioners, and in pursuance of any such scheme the Governor-General in Council may, by notification in the Gazette of India, amend the Second Schedule so as to include therein any medical qualification which entitles the holder thereof to be enrolled on the register of medical practitioners maintained by such authority.

(3) Such notification may also direct that an entry shall be made in the last column of the First Schedule against such medical qualification declaring that it shall be a recognised medical qualification only when granted after a specified date.

(4) The Governor-General in Council, after consultation with the Council, may, by notification in the Gazette of India, amend the Second Schedule so as to delete any medical qualification therefrom, or by directing that an entry be made in the last column of the Second Schedule against any medical qualification declaring that it shall be a recognised medical qualification only when granted before a specified date.

Power to require information as to courses of study and examinations

20. Every medical institution in British India which grants a recognised medical qualification shall furnish such information as the Council may, from time to time, require as to the courses of study and examinations to be undergone in order to obtain such qualification, as to the ages at which such courses of study and examinations are required to be undergone and such qualification is conferred, and generally as to the requisites for obtaining such qualification.

Inspection of examinations

21. (1) The Executive Committee shall appoint such number of medical inspectors as it may deem requisite to attend at any or all of the examinations held by medical institutions in British India for the purpose of granting recognised medical qualifications.

(2) Inspectors appointed under this section shall not interfere with the conduct of any examination, but they shall report to the Executive Committee on the sufficiency of every examination which they attend and on any other matters in regard to which the Executive Committee may require them to report.

(3) The Executive Committee shall forward a copy of any such report to the medical institution concerned, and shall also forward a copy, with the remarks of such institution thereon, to the Governor-General in Council.

Withdrawal of recognition

22. (1) When, upon report by the Executive Committee, it appears to the Council that the courses of study and examination to be gone through in any medical institution in British India in order to obtain a recognised medical qualification or that the standards of proficiency required from candidates at any examination held for the purpose of granting such qualification are not such as to secure to persons holding such qualification the knowledge and skill requisite for the efficient practice of medicine, the Council shall make a representation to that effect to the Governor-General in Council.

(2) After considering such representation, the Governor-General in Council may send it to the Local Government of the province in which the medical institution is situated, and the Local Government shall forward it, along with such remarks as it may choose to make, to the medical institution, with an intimation of the period within which the medical institution may submit its explanation to the Local Government.

(3) On the receipt of the explanation, or, where no explanation is submitted within the period fixed, then on the expiry of that period, the Local Government

shall make its recommendations to the Governor-General in Council.

(4) The Governor-General in Council, after making such further inquiry, if any, as he may think fit, may, by notification in the *Gazette of India*, direct that an entry shall be made in the First Schedule against the said medical qualification declaring that it shall be a recognised medical qualification only when granted before a specified date.

Power to make Regulations

23. (1) The Council may, with the previous sanction of the Governor-General in Council, make Regulations generally to carry out the purposes of this Act, and, without prejudice to the generality of this power, such Regulations may provide for—

(a) the management of the property of the Council;
(b) the summoning and holding of meetings of the Council, the times and places where such meetings are to be held, the conduct of business thereat and the number of members necessary to constitute a quorum;
(c) the powers and duties of the President and Vice-President;

(d) the mode of appointment of the Executive Committee and other Committees, the summoning and holding of meetings, and the conduct of business of such Committees;

(e) the conduct of business of Provincial Committees;

(f) the tenure of office, and the powers and duties of the Registrar and other officers and servants of the Council;

(g) the appointment, powers, duties and procedure of medical inspectors;

(h) the conditions upon which persons entitled to apply for enrolment may be enrolled on the Register, the form and particulars of applications for enrolment on or for amendment of the Register, the procedure in regard to enrolment on and amendment of the Register and the particulars which shall or may be entered on the Register;

(i) prescribing the fees which may be levied for anything done under this Act by or on behalf of the Council; and

(j) any matter for which under this Act provision may be made by Regulations.

(2) Until the first Council is constituted under this Act, any Regulations which may be made under sub-section (1) may be made by the Governor-General in Council; and any Regulation so made may be altered or rescinded by the Council in exercise of its powers under sub-section (1).

Information to be furnished by Council, and publication thereof

24. (1) The Council shall furnish such reports, copies of its minutes, abstracts of its accounts, and other information to the Governor-General in Council as he may require.

(2) The Governor-General in Council may publish, in such manner as he may think fit, any report, copy, abstract or other information furnished to him under this section or under section 21.

Commissions of Inquiry

25. (1) Whenever it is made to appear to the Governor-General in Council that the Council is not complying with any of the provisions of this Act, the Governor-General in Council may refer the particulars of the complaint to a Commission of Inquiry consisting of three persons, two of whom shall be appointed by the Governor-General in Council, one being a Judge of a High Court established by Letters Patent of the Crown, and one by the Council; and such Commission shall proceed to inquire in a summary manner and to report to the Governor-General in Council as to the truth of the matters charged in the complaint, and in case of any charge of default or of improper action being found by the Commission to have been established, the Commission shall recommend the remedies, if any, which are in its opinion necessary.

(2) The Governor-General in Council may require the Council to adopt the remedies so recommended within such time as, having regard to the report of the Commission, he may think fit; and if the Council fails to comply with any such requirement, the Governor-General in Council may amend the Regulations of the Council, or make such provision or order

THE FIRST SCHEDULE

(See SECTION 18)

Recognised medical qualifications granted by medical institutions in British India

Medical Institution	Recognised medical qualification	Abbreviation for registration
University of Allahabad	Bachelor of Medicine and Bachelor of Surgery .. Licentiate in Medicine and Surgery ..	M.B., B.S., All. L.M.S., All.
University of Bombay	Bachelor of Medicine and Bachelor of Surgery .. Doctor of Medicine Master of Surgery	M.B., B.S., Bom. M.D., Bom. M.S., Bom.
University of Calcutta	Licentiate in Medicine and Surgery .. Bachelor of Medicine Doctor of Medicine Master of Surgery Master of Obstetrics	L.M.S., Cal. M.B., Cal. M.D., Cal. M.S., Cal. M.O., Cal.
University of Lucknow	Bachelor of Medicine and Bachelor of Surgery ..	M.B., B.S., Lucknow.
University of Madras	Bachelor of Medicine and Master of Surgery .. Bachelor of Medicine and Bachelor of Surgery .. Doctor of Medicine	M.B., C.M., Mad. M.B., B.S., Mad. M.D., Mad.
Punjab University	Licentiate in Medicine and Surgery .. Bachelor of Medicine Doctor of Medicine Master of Surgery	L.M.S., Pun. M.B., Pun. M.D., Pun. M.S., Pun.

or take such other steps as may seem necessary to give effect to the recommendations of the Commission.

(9) A Commission of Inquiry shall have power to administer oaths, to enforce the attendance of witnesses and the production of documents, and shall have all such other necessary powers for the purpose of any inquiry conducted by it as are exercised by a Civil Court under the Code of Civil Procedure,* 1908.

THE SECOND SCHEDULE

(See SECTION 19)

Recognised medical qualifications granted by medical institutions outside British India

A. Registrable qualifications admitting primarily to the Medical Register granted by licensing bodies in the United Kingdom, as shown in Table (F) set out in the Medical Register for 1931 printed and published under the direction of the General Council of Medical Education and Registration of the United Kingdom in pursuance of the Medical Acts, 1858 and 1886.

B. Registrable qualifications granted by licensing bodies in British possessions, as shown in Table (I) set out in the said Medical Register, other than registrable qualifications granted by licensing bodies in India.

C. Registrable qualifications granted by licensing bodies in Foreign Countries, as shown in Table (J) set out in the said Medical Register.

ABSTRACTS FROM GOVERNMENT OF INDIA LETTER DEALING WITH THE BILL

A previous letter was addressed to the various Local Governments in 1928 on the subject of the establishment of an All-India Medical Council. The replies received to that letter showed that there was then no consensus of opinion in favour of the establishment of such a Council, and the local Governments which objected to the proposal did not change their views as the result of the conference of provincial representatives which was held in Simla on the 12th and 13th July, 1929, to discuss the whole question. The majority of the Ministers who attended that conference disagreed for one reason or another with the proposal, and the Government of India did not at the time proceed with it. The whole position, however, changed as a result of the action of the General Medical Council in deciding, in February, 1930, to withdraw, temporarily, the recognition of the medical degrees of Indian Universities. If Indian medical students were to be relieved of the hardships to which the decision of the General Medical Council exposed them, it was imperative to resume consideration of the proposal for the establishment of an All-India Medical Council, as the creation of such a Council offers the best, if not the only, prospect of again securing the General Medical Council's recognition of Indian degrees. The Government of India, who had never departed from their view that the proposal to establish an All-India Medical Council is sound in principle, accordingly arranged, with the concurrence of local Governments, to convene a second conference, in June, 1930, to consider the matter afresh. All local Governments, except Assam, were represented at the Conference. All the Universities in British India which possess Medical Faculties were also represented, by one delegate elected by each such faculty.

The views which the Conference expressed upon the subject of establishing an All-India Medical Council are contained in resolutions passed at the meeting. The Conference unanimously resolved that the establishment of an All-India Medical Council is essential and acceptable in principle, and that a Bill should be drafted and legislation enacted to bring the Council into being as soon as possible. The Government of India think that the views which the Conference expressed upon the subject will command general approval, and that the establishment of the Council is the best and most practical way of affording relief to

the Indian medical students who have suffered from the General Medical Council's decision. They have, therefore, gladly taken the first step towards giving effect to the Conference's view by drafting a Bill for circulation with a view to eliciting opinion. It will be observed that the Bill is not an amended copy of the previous Bill but is a completely fresh piece of work, conceived on simpler and more suitable lines than the previous Bill, and in general accordance with the views expressed at the Conference.

Composition of the All-India Medical Council.—In framing their proposal for the composition of the Council, the Government of India have closely followed the views expressed by the Conference. The Conference recommended that the Council should consist of—

(a) A President;

(b) One member to be nominated by each local Government;

(c) One member elected by the Medical Faculty of each University in India;

(d) One member to be elected by the medical graduates of each province in which there is a medical register; and

(e) Three members nominated by the Government of India.

The Government of India think the proposals under (a), (b) and (e) which provide for the adequate representation of the Central and Provincial Governments upon the Council will be generally approved. No questions are in their opinion likely to arise about any of them except, under (a), as regards the method by which the President should be appointed. The Conference recommended that the President should for the first three or five years be nominated by the Governor-General in Council, and that he should thereafter be elected by the Council itself. The Government of India are, however, disposed to doubt the advisability of this. In view of the close association which should exist between the Central Government and the proposed organisation, they think that it is probably desirable to reserve the power of nomination to this important post to the Governor-General in Council perpetually. Clauses 3 and 3-A of the Bill have been drafted so as to give the choice between these alternatives.

As regards the proposal referred to at (c) above, the Conference contemplated that every University in India which has a Medical Faculty should be entitled to elect one representative to the Council. The Government of India, however, think that for the present the scope of the Bill should be limited to universities which are in British India. They are also disposed to doubt whether it is necessary and desirable to grant each such University the right to elect a separate representative to the Council. If each University is granted separate representation, the Council will be automatically enlarged every time a new University with a Medical Faculty springs up or new medical faculties are established. With a view to curtailing the size of the Council as much as possible, the Government of India are provisionally of opinion that, if any province has more than one University with a medical faculty attached, those two or more Universities should be granted the right of electing one representative between them, rather than that each such University should be granted separate representation.

The recommendation made by the Conference as regards (d) in paragraph 4 above, was not reached without much discussion, and the alternative of granting representation on the Council to Provincial Medical Councils was considered at length. The Conference did not in the end accept the alternative, but the Government of India consider that there is much to be said for giving Provincial Committees of the Council, as defined in the Bill and referred to in paragraph 8 below, representation on the Council in place of graduates. The link between the Committees and the Council should be close, and an obvious way of securing that is to grant them the right of electing one member each to the Council. Should the view which the Conference

held on this point be adopted, the Government of India consider that no person should be eligible to represent the medical graduates of a province unless he possesses the qualifications prescribed in 5(3) of the Bill, which has been drafted with regard to the view of the Conference that representatives of graduates should have actual experience of the teaching of medicine. It would not appear necessary to prescribe such conditions of eligibility if it is decided to confer representation on representatives of provincial committees, and not upon graduates as such.

If the views which the Government of India have expressed above are accepted, clause 3 should be preferred to the alternative clause of that number, and the Council should be composed as shown therein. It would consist at present of 28 members, which would appear neither too large nor too small for the work devolving on it.

Committees of the Council.—The Council in view of its size and the fact that it will be drawn from all over India will not be able to meet frequently. Clause 8 of the Bill provides that the Council shall meet not less frequently than once a year, but it will probably not be able to meet more often than that. Much of its work should therefore be done through a committee or committees. The Government of India think that it will be desirable to set up a small Executive Committee of seven members, composed as mentioned in clause 10 of the Bill, and to charge that Committee in especial with the inspection of examinations, as proposed in clause 21 of the Bill, so as to ensure that no delay occurs in the disposal of this very important part of the Council's work. The Government of India think, however, that, in addition to this, Provincial Committees should be formed, as provided in clause 11 of the Bill, in provinces in which Provincial Medical Councils are constituted. The formation of such Committees appears to the Government of India to be desirable so as to associate the provinces as closely as possible with the Central organisation, quite apart from the necessity of giving the Council assistance with its work. The Government of India propose to assign such committees very important duties in connection, for instance, with the enrolment of candidates (clause 13), the erasure of the names of persons guilty of improper conduct (clause 15) and re-enrolment of those who satisfy the Committees that they deserve to be re-enrolled (clause 16).

Functions of the Council. Inspection of examinations.—It will be recognised that the functions to be assigned the Council will to a certain extent affect the powers which the provinces have hitherto enjoyed in the regulation of medical standards. There is, however, no alternative to this; if the All-India Council is to do real and useful work it must exercise definite powers and rights. The Conference of June, 1930, recognised this, and agreed that it is necessary to ask the provinces to submit in certain matters to the jurisdiction of the Council. The Government of India have, however, drawn the Bill on lines which affect provincial powers as little as possible, and have kept the point constantly before them in considering what the functions of the Council should be. One of the most important of them will be the inspection of the examinations held by medical institutions in British India for the purpose of granting recognised medical qualifications. Unless the Council is empowered through its Executive Committee to inspect such examinations, it will not be able to satisfy itself, or other provinces of India or other countries of the standard of the arrangements made for the teaching of medicine in India. Clause 21 of the Bill, which is generally in accord with the proposal made at the Conference of June, 1930, defines the duties which it is proposed to lay on the Executive Committee in this matter. The strength and composition of the agency which the Committee will employ for this work are left to the Committee's determination, but the Government of India anticipate that the Committee will employ the Registrar of the Council upon this work if, as is likely, he is a qualified medical man,

and will give him the assistance of a number of Inspectors appointed temporarily for the purpose from time to time. It will be observed that the clause gives the Inspectors powers of report only, and that provision is made for copies of their report to be furnished to the institution inspected and to the Governor-General in Council.

Maintenance of a register, and recognition and withdrawal of recognition of medical qualifications.—These important matters are dealt with in clauses 12, 18, 19 and 22 of the Bill. Under clause 12 the Council will maintain its own register, as is clearly necessary. In compiling it and keeping it up-to-date the Council will, however, under clauses 13, 15 and 16, act through and with the assistance of the Provincial Committees and, as remarked in the notes on clause 13, will be able to overrule the Committees only in the circumstances provided for in clauses 13(2) and 15(2). Clauses 18 and 19 deal with the qualifications which candidates for enrolment must possess and the procedure by which the list of recognised qualifications may be added to or cut down. The Government of India, after very carefully considering what qualifications should be recognised at the start of the Council's existence, are of opinion that the only feasible course is to recognise those qualifications only, whether Indian, British, or foreign, which were recognised at the time that the General Medical Council took its action in February, 1930. All such qualifications are up to a standard which was formerly accepted; the recognition of other qualifications should be left for consideration in accordance with the Bill. The Schedules to the Bill have been drawn up accordingly. Clauses 19(4) and 22 provide for their amendment, if amendment is necessary; the latter clause provides, in the case of qualifications granted by British Indian institutions, that the institution and the local Government of the province within which it is situated may be referred to before recognition is withdrawn.

If clause 18 is adopted, licentiates will not be eligible for registration with the Council at the time that it comes into being. Nothing in the Bill specifically excludes licentiates permanently, but it does not appear likely that the Council would grant them recognition if it were applied for under clause 18 (2). The question of bringing licentiates within the scope of the All-India Council has been raised; the opinions then expressed were, with very few exceptions, in favour of confining the Council to dealing with graduate qualifications. The Conference of June, 1930, was also of opinion that the Council should, at any rate at the start, deal only with such qualifications, and the Government of India think that in the present state of medical education in the country there is much to be said for that view. Organisations of licentiates have, however, petitioned the Government of India that they should be brought within the purview of the Council from the start.

Enrolment, erasure and re-enrolment of names upon the Register.—The procedure which the Government of India think should be adopted in connection with enrolment, erasure and re-enrolment of names are fully set out in clauses 13 to 16 of the Bill.

Something should be said on the financial aspect of the proposals, which is not referred to in the Bill. As the Council will be an organisation of the Central Government, the Government of India accept the expenditure on it, other than expenditure on travelling and other allowances of provincial representatives, as a charge against central revenues, and will not ask the provinces to contribute towards it. A point for consideration, however, having regard to the heavy expenditure, likely to be between Rs. 80,000 and Rs. 90,000 per annum, which the maintenance of the Council will involve, is whether fees should be charged from persons who register themselves with the Council. The Conference of 1930 recommended that no such fees should be charged. In support of that view it might be argued that registration with the Council will be of direct benefit only to Indian medical men who

desire to practise their profession abroad; as only a very small percentage of Indian doctors desires to practise abroad, registration would not directly benefit the great majority of persons who will enrol themselves with the Council. The charging of fees in such circumstances might act as a deterrent to registration. It might also be argued that if fees are charged, they will constitute a kind of subvention from provincial revenues towards the cost of an essentially central organisation, and that the yield from fees would be insignificant in comparison with the cost of the Council. On the assumption that on an average about 300 Indian medical students graduate annually, fees for registration, if fixed at Rs. 75 each, would bring in only Rs. 22,500 per annum; and in view of the rates which are charged for registration with provincial medical councils, the fee might well have to be fixed at less than Rs. 75. On the other hand it might be argued that the levying of a fee would not be likely to act as a deterrent to registration; even if registration would confer direct benefits only on doctors who desired to proceed abroad, those who stayed in India would gain status and reputation by registering themselves with a body which would be of international standing and repute. It would appear fitting that graduate members of the medical profession should at the time of registration make a small contribution to the expenses of the Central Council which worked in their general interest, and, even if the yield from fees were small, it would do something to lighten the burden which the creation of the Council will impose upon the finances of the country and should not be sacrificed at this time of financial stringency. Under clause 23 (1) (i) of the Bill the matter is left for determination by issue of regulations of the Council.

THE FACULTY OF TROPICAL MEDICINE, BENGAL

THE following students are declared to have passed the L.T.M. Examination, Session 1931—

Passed with distinction

1. Dr. Eunice Ruth Hull, M.D. (U. S. A.), In-charge, Mission Dispensary and Hospital, Chhatarpur, Central India.

Passed

(Arranged in alphabetical order)

2. Dr. Barandra Nath Basu, L.M.F., Private Practitioner.
3. Dr. Rajendra Nath Bhattacharji, L.M.P. (Bihar and Orissa), Private Practitioner.
4. Dr. Uttam Chandra Bhattacharyya, L.M.P., Medical Officer, Lelikoojan Tea Estate, Assam.
5. Dr. Ratneswar Bhuyan, L.M.P. (Assam), House Physician, B. W. M. School and attached Hospital, Dibrugarh.
6. Dr. Nityaniranjan Bose, L.M.P. (Patna), L.M.F. (Cal.), Epidemic Medical Officer, Dumka, Santal Parganas.
7. Dr. Basanta Kumar Chatterjee, L.M.F., House Surgeon, Calcutta Medical School and Hospital.
8. Dr. Damri Lal, L.M.P. (Bihar and Orissa), Sub-Assistant Surgeon, Government of Bihar and Orissa.
9. Dr. Manohar Lal Dang, L.M.P., I.M.D., I.M.H., Dehra Dun.
10. Dr. Vasant Ganapatrao Dessai, L.C.P. & S. (Bom.), Private Practitioner.
11. Dr. Chinta Haran Ghose, L.M.P. (Dacca), Local Indian Doctor, In-charge of Sonali Dispensary, Purnea.
12. Dr. Dev Raj Handa, L.S.M.F. (Punjab), Medical Officer, Jakhanli, Rohtak.
13. Dr. Bawa Hansraj, L.S.M.F., I.M.D., Government of India.
14. Dr. Jit Raj, L.S.M.F. (Punjab), Private Practitioner.
15. Dr. Alice Lazarus, L.M.P., Lady Sub-Assistant Surgeon, Government of Madras.

16. Dr. Maharaj Narain Mathur, L.M.P. (C. P.), Sub-Assistant Surgeon, Victoria Hospital, Ajmer.
17. Dr. Janakrai Shivadatrai Mankad, L.C.P. & S. (Bom.), Medical Officer, Female General Ward, Sir Rasulkhanji Hospital, Junagadh.
18. Dr. Ratilal Narbheshanker Maru, L.C.P. & S. (Bom.), Dr. Dhudasia Travelling Dispensary, Jamnagar State.
19. Dr. Dalichand Madhaujee Mehta, L.C.P.S. (Bom.), Second Assistant, Sir Rasulkhanji Hospital, Junagadh.
20. Dr. Moses Solomon, L.M. & S., Sub-Assistant Surgeon (Railway Board).
21. Dr. Sanaton Mukherjee, L.M.P., Sub-Assistant Surgeon, In-charge Anandpur Dispensary, Keonjhar Feudatory State, Orissa.
22. Dr. Sasanka Kumar Mukhopadhyaya, L.M.F. (Bengal), Temporary Medical Officer, P. W. D. Dispensary, Jainti, Jalpaiguri.
23. Dr. Abhoya Charan Paul, L.M.P., Private Practitioner.
24. Dr. Ashutosh Rakshit, Sub-Assistant Surgeon, Government of Bihar and Orissa.
25. Dr. Pingaly Seshagiri Rao, L.M.P., D.P.H. (Madras), House Surgeon, Lying-in-Hospital, Royapuram.
26. Dr. Shyamballov Roy, L.M.F., Private Practitioner.
27. Dr. Kali Das Sen Gupta, L.M.F., Employee of Dinajpur District Board.
28. Dr. Permatma Prasad Sinha, L.S.M.F. (Railway Board).
29. Dr. Tiruvadi Vaitheswaran, L.M.P., Sub-Assistant Surgeon, Government of Madras.

Current Topics

Acidosis from the Clinician's Point of View

By LEONARD FINDLAY

(Abstracted from the *International Medical Digest*, Vol. XVIII, No. 6, June, 1931, p. 329)

Acid is always being produced in the body as a result of katabolic activity, but its neutralization and excretion are provided for through the activity of the transport organ (the blood) and the excretory organs (lungs and kidneys). So long as this production of acid remains within normal limits, and the organs engaged in its removal are healthy, there is no evidence of any disturbance. When, however, the production of acid is excessive or pathological in amount, or abnormal or pathological in kind, the efforts of the body must be increased. Further, if the organs employed in the removal of these acids are diseased, not only will the difficulty experienced in their elimination appear earlier, but it will be proportionately greater.

No free acid can circulate in the blood except CO₂. All other acids must be combined with base. The total acid and basic elements which go to form the reaction of the blood are practically constant and perfectly balanced with each other. So far as the acid elements are concerned, therefore, a certain definite amount only can be carried; if some abnormal acid is present, or if one of those normally present is increased in amount, it will only be at the expense of and by replacing so much of one of the others—usually CO₂ since it is the most volatile acid; hence the indication of an increased formation of acid in the body, and of a tendency to the production of a more acid reaction of the blood and tissue juices, is a low CO₂ blood content. It is on account of the lessened power of the blood to carry CO₂, and the consequence that a larger proportion is free, that the respiratory centre is stimulated to a greater activity, with the resulting characteristic symptom of hyperpnoea. However, a low CO₂ blood content does not always indicate a tendency to the production of a more acid state of the blood.

If the diminished CO₂ content results from a more rapid loss of CO₂ than normal by forced respiration,

which may be performed voluntarily, or as the result of high altitudes (mountain sickness), or in consequence of the hyperpnoea, which is at times a manifestation of encephalitis lethargica, then the primary change is a loss of normal acid, and the tendency will be toward the production of a more alkaline blood—the state of so-called alkalosis. This will tend to be rectified by an increase in some of the other acid elements in the body, the chlorine or organic acids. In alkalosis produced at high altitudes from the loss of CO_2 , and in the alkalosis found in pyloric stenosis due to a diminution of the chlorine, acetonaemia does occur, this being significant of an increased formation of the organic acids of the oxybutyric series. Acetone in the urine simply results from incomplete combustion of fats, and may be present both in acidosis and in alkalosis. In the former it is the primary change producing a rise in the total acids, whereas in the latter the formation of excess of ketone acids, probably the result of defective oxidation, makes up for a deficiency of acid, and so helps to bring the reaction from the alkaline side back to normal.

The so-called 'buffer action' of the blood, which comprises a complex physicochemical mechanism involving practically all the constituents of the blood, is not the sole means of the body's protection, since the excretory functions of the lungs and kidneys, and probably intestines also, play an important part. Excessive amounts of CO_2 are got rid of by the lungs; this may be revealed by the characteristic hyperpnoea of acidosis. The volatile acids of the oxybutyric series are also in part expelled by the lungs, and consequently there is another characteristic symptom, the smell of acetone in the breath. By the kidneys there is increased acid excretion, increase in ammonia formation to aid in the excretion of acids and to neutralize tissue juices, increase in fixed base excretion—for example, Ca from the bones and Na and K from the tissues generally—and, as it is the salts of the body which in great part retain fluid, this resulting diminution in their amount allows of the escape of fluid. In view of this function of the lungs and kidneys in rectifying any tendency toward the production of a hyperacid blood and plasma fluid, the importance of the health of these organs is apparent.

In fatal cases of gastro-enteritis a state of acidosis is often observed. This arises both from the increased production of acid in the body and an increased loss of base available for its neutralization. The former is due to the necessary concomitant starvation in consequence of the vomiting and defective absorption from the gut, apart altogether from any therapeutic deprivation of food; the latter accompanies the loss of fluid by vomiting and diarrhoea. The acidosis in gastro-enteritis is merely an indication of the severity of the lesion, and is in no way concerned with an explanation of the aetiology of the condition. Nevertheless, it shows how the fatal termination may be contributed to, and it certainly suggests that the rational treatment is to replace that loss of fluid and to hinder the production of acetone bodies by the administration of water, salts and glucose. This should be done at all costs; if they cannot be retained in the usual way, they must be administered either by the venous or the peritoneal route.

In diabetes mellitus, owing to disease of the pancreas, the patient is unable to utilize or combust sugar, and so fats are incompletely burned with the production of ketones (the acetone series). These bodies accumulate and compete with the CO_2 for the available alkali of the blood. This results not only in a diminished amount of CO_2 per unit of blood, but in a relatively increased proportion being in the free state—hence the hyperpnoea. In diabetes there is another factor working in the same direction. In consequence of the diuresis there is a washing out of the fixed alkali (Na, K, and Ca) available in the body for neutralizing the increased formation of acid. The kidney itself, however, plays an important part in minimizing this loss of base by a great increase in the formation of ammonia, which

to a large extent takes the place of the fixed alkali. It is well known that renal disease increases the gravity of diabetes mellitus, and it is probable that the impaired formation of ammonia is the serious factor.

Nephritis should be considered as a disease contributing toward acidosis, since it is an example of interference with the normal excretion of the acid products formed during the processes of metabolism rather than of the production within the body itself of increased or abnormal acid.

The Significance of a Raised Blood Pressure

By JOHN HAY, M.D., F.R.C.P.

(Abstracted from the *British Medical Journal*, July 11th, 1931, p. 43)

TREATMENT

I AM quite aware that, interested as you are in the pathogenesis and prognosis of high blood pressure, you are probably more interested in the management and treatment. Unfortunately, the opportunity for treatment generally arises when the high blood pressure is well established. In any case, the preliminary is a careful and detailed examination and cross-examination—the latter being the more important. It is essential to discover the responsible aetiological factors. Heredity, habits of life, diet, the existence of overwork, mental strain, worry, embarrassments (either matrimonial or financial) must be investigated. You must know your man before you tackle his malady.

It is dangerous, not only for the patient's peace of mind, but also for the doctor, to focus attention too persistently on the sphygmomanometer readings. Since a rise in blood pressure is for many patients a compensatory phenomenon, it is obvious that some attempt must be made to determine the optimum pressure in each individual, and not to attempt to reduce it below that level by drugs or drastic remedies. There is some truth in the saying that the greatest danger to a man with a high blood pressure lies in its discovery, because 'then some fool is certain to try and reduce it'.

General Measures

In the later stages more can be done by careful revision of the mode of life, undertaken with the active co-operation of the patient, than by any drugs prescribed for the specific purpose of lowering the pressure. If the patient is in the early or pre-sclerotic stage, or if the cardio-vascular damage is not advanced, the response to treatment is much more satisfactory, and a great deal can then be done if he will pay the price. When feasible, as a first step in treatment, it is well worth while to order the patient to bed for a few weeks, and at the same time to prescribe a mixture of bromides, or bromide and chloral, with the object of diminishing restlessness and irritability. When the nervous factor is dominant, rest will probably bring about a material fall in the pressure, and those with cardiac symptoms will certainly be benefited. This will afford an opportunity to observe your patient, and to determine in what way and to what degree his manner of life should be modified. Then get him off to the country or to some spa for a month's quiet holiday.

High blood pressure is often the penalty of success—a success the result of continuous hustle and mental strain. The successful man does not walk, he rides. His meals tend to become richer. His friends take advantage of his efficiency; flatter him and impose upon his good nature; and accordingly he is a member of this and that committee, is treasurer of one society and secretary to another, so that the load he has to carry is considerable. While at rest and in the hands of his doctor he must be made to edit the list of his duties and responsibilities, and cut out everything that is not essential to his happiness or his financial stability, so that when he returns to work he has shed that which was irksome and unnecessary. This short period of rest

also offers an opportunity for investigating any and every possible source of infection, and it is well to deal with any such focus and to make sure that the teeth are sound and the gums healthy.

In so far as it is possible to remove causes of worry and anxiety, this should be done; occasionally in suitable cases psychotherapy may yield valuable assistance in restoring psychic rest.

To begin with it is wiser not to prescribe drugs, but rather to note the effect of general treatment. Exception may be made, however, in the case of restless and excitable patients; then bromide, or bromide and chloral, is valuable; salines and—if necessary—a simple stomachic may be given with advantage.

Regulation of Diet

The diet will require supervision, especially in those who are well above the normal in weight. Every unnecessary pound in weight adds to the load the heart has to carry.

The first essential is to diminish the intake. As one patient put it, after a heart-to-heart talk, 'It seems to me that I must keep my head out of the nosebag'. I do not believe it wise to give the patient detailed instructions as to diet. He should grasp the main principle—namely, that the diet must be simple, wholesome, and small in amount. 'No second helping' is a good rule, and he will do well to remember that 'a good cook may be more dangerous to a man in health than a bad doctor when he is sick'. He must keep an eye on the scales. If the weight keeps up, the intake of food must go down.

He will probably find it easier to eat less if he takes his meals with a minimum of fluid. Water can be taken on rising, and again before retiring. The starches and the fats should be eaten sparingly, and it is probably wise to refrain from a diet rich in extractives. Gravies, soups, rich stews, and hashes should be avoided, especially when there is evidence of renal damage. Fresh fruits, salads, lettuce, celery, vegetables, milk, and honey should find an honoured place in the menu; and fish, cold boiled bacon, lean ham, and chicken may be allowed. Butcher's meat should be eaten moderately, and beyond the salt used in cooking none should be taken. Alcohol is better deleted from the diet, and any excess in tea, coffee, and tobacco avoided. The diet should be such that the patient likes what he eats, though it is obvious that he should not be allowed to eat just what he likes.

As someone has aptly said, 'In few conditions are both the dish of herbs and contentment more essential, or the stalled ox and strife more injurious'.

When possible, an occasional day in bed is helpful. In the more advanced cases, with indications of commencing cardiac failure, it is invaluable. During that day the patient should drink plenty of water, lemonade, orangeade, barley water, raisin tea, or weak tea, and refrain from solid food, with the exception of a few biscuits and honey, or an apple.

The Use of Drugs

Drugs, although of secondary importance, have their honoured place in treatment, more especially in the earlier stages. Later they are useful in treating various distressing symptoms—cardiac, cerebral, or renal. The benefit to be obtained in the earlier phases from bromide has already been mentioned, and it is of great service in menopausal hyperpiesia. Mercury, as a blue pill, or a dose of calomel, followed the next morning by a small but concentrated dose of saline, is undoubtedly of benefit. Such a pill should be taken once a week and the saline every morning—not to procure free purging, but one loose rather watery motion each day. Iodine and the iodides are still popular and widely prescribed, either in very small doses, such as 1/10 grain of the iodide, or in the large dose of 10 grains. Iodine is acceptable either as collosol iodine or as the tincture—five to seven drops of the latter stirred up in an ounce or two of milk is not unpalatable, the small fraction of potassium iodide in the British tincture being an

advantage rather than otherwise. If iodism is produced then the French Codex tincture can be used. The myocardium suffers from the toxæmia accompanying any infective illness, especially influenza, and during convalescence (which should be prolonged) hæmatics are essential—simple iron preparations with or without arsenic.

There are three drugs which have come more prominently into notice in the last few years: luminal, acetylcholin (acecoline, pacyl), and the sulphocyanates of potassium and sodium. Their tendency is to lower the blood pressure, and their action is evanescent. They are more likely to be of service in the earlier than in the later stage, before gross pathological changes have taken place. Luminal has, in addition, a helpful sedative effect. The sulphocyanates are prescribed in doses of 1½ to 2 grains three times daily after food, the dose being increased gradually day by day. I question whether the nitrites are of any value, except to bring about an immediate and temporary lowering of the pressure.

It is well to remember that the blood pressure is constantly varying both in health and in disease, and that, within certain limits, the normal has been established. When the figures pass beyond this normal there is a corresponding diminution in the expectation of life. It is therefore a physical sign worth investigating in every patient, especially when there is a known familial tendency to cardio-vascular disease. There is here a wide field for study, more particularly for the general practitioner.

Therapeutic Serums and Allergic Dangers

(Abstracted from the *Journal of the American Medical Association*, Vol. XCVI, No. 23, June 6th, 1931, p. 1955)

EVERY one who deals extensively with immune serums realizes that their practical use is attended with certain menaces. These involve manifestations of hypersusceptibility in man. Such a condition may arise in persons in whom a definite previous sensitization has been effected and likewise in those for whom no such sensitization is known or can be conclusively proved. Anaphylactic shock occasionally occurs. So-called serum disease is a more widely-known phenomenon. It follows not infrequently on subcutaneous, intravenous or intrathecal injections of animal serums employed for therapeutic purposes and may be delayed or accelerated. The most common symptom is a skin eruption, which is usually urticarial but may vary considerably in type. Oedema may appear in various parts of the body, notably the face. Multiple joint pains, albuminuria, leucocytosis and general malaise are sometimes encountered.

The possibility of these occurrences may indicate why the use of therapeutic serums awakens hesitancy in a physician faced with the possibility of discomfort, harm and even death in a patient despite all care to avert any untoward effects. Favourable statistics demonstrating that alarming symptoms occur in only a small proportion of those treated offer slight comfort to the practitioner faced with the necessity of action. As in the case of anaesthesia, there is little consolation in the thought that its accidents are repeated at only rare intervals. The menace remains for each patient.

It has been remarked that the only procedure theoretically available for safe serum therapy consists in employment of therapeutic serums derived from animals to the protein of which the recipients show no hypersensitiveness. In practice this procedure usually cannot be carried out because therapeutic serums are prepared from horses almost exclusively. Accordingly, attempts have been made to subject serums or potent serum constituents to procedures that might overcome their species specificity without entirely destroying their remedial action. The most recent effort is reported by Bronfenbrenner, Hetler and Eagle from the Washington University Medical School in St. Louis. They report that, out of many procedures tried so far, coupling with

diazotized aromatic amines has given in general the most promising results. Among the compounds prepared, good results were obtained by coupling immune serums with diazonium salts of paratoluidine, paranitrosidine, atoxyl, sulphanilic acid, anthranilic acid, naphthionic acid and amino R salt. The preparations obtained have lost their species specificity. They were not precipitated by the potent anti-horse precipitating serum. They did not cause anaphylaxis when injected intravenously into guinea-pigs highly sensitized to horse serum, nor did the injection of these compounds protect the animals against subsequent death from injection of unmodified horse serum. They did not cause skin reactions in persons having horse asthma.

Preparations of this sort have in many instances retained 'nevertheless to a fair degree their specific immune properties', as extensive tests on animals have revealed. It is far too early to foresee to what extent, if any, these new observations will find application to the problems of human therapy with immune serums. However, they represent a step in the direction of progress; they give promise of more satisfactory procedures in averting the disasters of hypersensitiveness in man; and they are heartening at a time when physicians often find themselves steering between the Scylla of serious disease and the Charybdis of anaphylactic danger in a sea of therapeutic necessity.

Ménière's Disease

By W. S. THACKER NEVILLE, M.D. (Dub.)
F.R.C.S. (Edin.)

(Abstracted from the *British Medical Journal*, July 11th, 1931, p. 54)

For many years it was taken for granted that Ménière's disease was due to hæmorrhage into the labyrinth. This misconception was due to a faulty reading of Ménière's original paper, in which there is no mention of this condition. He described the material found in the labyrinth of his well-known case as being composed of reddish plastic lymph. Alexander of Vienna considers that Ménière's patient suffered from leukaemia complicated by a leukæmic hæmorrhage into the labyrinth. Escat thought that Ménière's disease occurred only in arterio-sclerotics, and ascribed the paroxysmal attacks to an intermittent spasm of the internal auditory artery, and the apoplectic attacks to hæmorrhage.

The exclusion of labyrinthine hæmorrhage as an ætiological factor placed this disease in a less formidable light, for hæmorrhage from one intracranial blood vessel implies the possibility of hæmorrhage from another, secondary to arterio-sclerosis and high blood pressure. But hæmorrhages, arterio-sclerosis, and high blood pressure are absent in Ménière's disease. The vertigo due to spasm of the cerebral arteries in patients with arterio-sclerosis must be distinguished from the vertigo of Ménière's disease in which tinnitus and deafness are prominent symptoms.

INTRACRANIAL CAUSES

The rejection of hæmorrhage and arterio-sclerosis as causes of this disease was followed by many theories and, naturally, by as many treatments. Thornval, a recent writer, considers that the main disturbance is in the medulla oblongata. Charcot (1874) and Dandy (1928) put forward the view that there was a lesion of the auditory nerve and not of the semicircular canals. Charcot recommended division of the nerve, and Dandy divided the nerve in nine cases with a resulting cure. Aboulker thinks that the syndrome is due to pressure on the nerve from a collection of fluid around it—that is to say, to an encysted meningitis or hypertension of cerebro-spinal fluid in the lateral cisterna. He consequently does a decompressive trephine behind the mastoid, with or without incision of the meninges. Babiniski, and, later, Blake, must have had the same idea, as they treated their patients by lumbar puncture. Quix also believes that this disease is due to intracranial

hypertension, which acts on the otoliths *via* the ductus endolymphaticus instead of on the nerves. Kobrak also subscribes to this theory of an intracranial origin. According to his view the trouble is localized behind the labyrinth mainly in the cisterna points, and the increased pressure is transferred to the labyrinth *via* the porus acusticus or saccus endolymphaticus. He thinks that the excess of fluid is caused by an irritation of the choroid plexus or is due to a transudation resembling a circumscribed œdema of the skin. Kobrak uses atropine, pilocarpine, and adrenaline in examining his patients to find out whether the syndrome is associated with a vagotonic or sympathicotonic condition.

INTRA-AURAL CAUSES

The other theories to be considered all agree that the origin is intra-aural rather than intracranial. Thus Witmaack is of the opinion that toxins produced by a catarrhal condition of the middle ear diffuse into the labyrinth *via* the windows, and so produce an intra-labyrinthine hypertension. Quincke believes that the symptoms are due to an angioneurotic œdema of the labyrinth, which brings about an increase in tension of the endolymph. According to Portmann the hypertension originates in the labyrinthine blood vessels. He calls this hypertension of the labyrinth 'glaucoma of the labyrinth', and considers that Ménière's syndrome is closely connected with vasomotor phenomena, and hence with sympathetic equilibrium. He believes that the vertigo is caused by a vaso-constriction of the blood vessels of the labyrinth, while tinnitus and deafness are produced by vaso-constriction of the vessels of the cochlea. This vaso-constriction elsewhere would produce pain, as in frostbite or Raynaud's disease. The sign of labyrinth disturbance is vertigo, just as the sign of a diseased cochlea is tinnitus. This vaso-constriction disappears after a sympathectomy, the consequence of which is a vaso-dilatation of the blood vessels of the labyrinth. He also considers that the constriction of the blood vessels may be caused by adrenaline. Portmann does not know whether the vascular stasis produced by vaso-constriction acts directly on the nerves or, as the result of an increase of pressure, on the semicircular canals. With the idea that vertigo was due to an increase of pressure in the semicircular canals he opened the saccus endolymphaticus after performing a mastoid operation without opening the antrum. On the supposition that vertigo was purely a vasomotor reaction he performed a perivascular sympathectomy on the common and internal carotid arteries, and injected drugs which inhibited the sympathetic system, attempting to cause peripheral vaso-dilatation by hot baths. Halphen, on the same grounds, applied cocaine (Bonain's solution) to the sphenopalatine ganglion, and stated that this led to the disappearance of the vertigo after an hour or two; this was due, presumably, to the inhibition of the sympathetic system. Lermoyez recommended liquor trinitrini in cases of suspected spasm of the internal auditory artery. Amyl nitrite and benzyl benzoate have also been recommended. Muck agrees with Portmann in that he has found his vaso-constrictor nasal reflex present in Ménière's disease. This indicates, according to Muck, the presence of an angiospastic condition of the auditory artery. He has successfully treated five patients with a meatless diet.

FAULTY WATER METABOLISM

Finally, Dida Dederding and Dr. Mygind of Denmark have originated a theory which solves all these problems. They definitely state that the symptoms of Ménière's disease are due to increase of pressure in the semicircular canals, which produces vertigo and deafness by displacement of the stapes. They attribute this increased pressure to a faulty water metabolism, which allows water to collect intracellularly, resulting in subcutaneous infiltrations, overloading of the fluid in the labyrinth, and increase of pressure in the cerebro-spinal fluid. To the well-known signs of Ménière's disease—namely, tinnitus, vertigo, and deafness—they add the attribute

of variability of these signs, the variability being due to the amount of water retained at the time. Thus, after exercise sufficient to produce perspiration, or following a decreased intake of water and salt, air conduction and bone conduction improve; while after an increased intake of fluid, air conduction and bone conduction decrease, and the latter may even be absent. Low notes are usually not audible, while high notes are well heard. This shows that the cochlea is intact and that hearing can be saved. In late cases the high notes are lost. These writers find the tympanic membranes retracted as a result of stenosis of the Eustachian tube, and so they look upon catheterization as an essential part of the treatment. The stenosis is caused by water-logging of the lining mucous membrane. The examination of the labyrinth reveals abnormality of the semicircular canals; nystagmus occurs spontaneously, or it can be induced by the inhalation of amyl nitrite, and the turning chair shows a difference in the direction of right and left after-turning nystagmus. The proof that these patients suffer from a faulty water metabolism is that if 1,000 c.cm. of water is administered, only 400 to 500 c.cm. will be passed in four hours, whereas a normal person will pass the 1,000 c.cm. or more during this period. Furthermore, a patient with Ménière's disease will increase in weight corresponding to the amount of water retained; that is to say, if a patient retains 500 c.cm. he will increase in weight by 400 grams, allowing 100 c.cm. for loss through the skin and lungs.

A hæmocritic test also shows that in a normal person the blood becomes diluted half an hour after intake of water and regains its normal concentration an hour later, while in a waterlogged patient with Ménière's disease there is no alteration in the dilution of the blood. A waterlogged patient also shows a loss of hæmoglobin, the hæmoglobin being about 73 per cent. The third proof offered is that an intravenous injection of salyrgan (1 c.cm.) causes diuresis, which commences immediately and lasts two days in a patient with Ménière's disease, while in a normal person the diuresis lasts one day, and there is a decreased output of urine on the second day. In certain patients with only tinnitus and catarrhal otitis disordered water metabolism has been found. These cases can be recognized by noticing an alteration from hour to hour in the perception of low tones or in the air conduction.

TREATMENT

The treatment of Ménière's disease, based on this theory, consists in diminishing the intake of fluid so that the patient loses weight and is actually thirsty. For dietetic purposes fruit and vegetables are considered to be fluid. One also must promote the loss of water by carbonic acid, fir needle, and mud baths, and by the Scotch douche, by exposure to the carbon arc up to one hour three times a week, and by massage. Diet must be salt-free. Local treatment consists in catheterization of the Eustachian tube. The drug treatment in this Danish school is unimportant. Like others they treat the acute attack with atropine, but have found ergostinine also useful. An injection of salyrgan is followed up by a long course of calcium-diuretin; while calcium, ovarian, and thyroid extracts are also used.

I myself have had great success in employing a salt-free diet with a decreased intake of fluid. I have also used a drug (in a few cases) which has been investigated by Berggren—namely, bulbocapnin (Merck). This drug is as valuable in Ménière's disease as ephedrine is in asthma. My patients take one tablet (0.1 gram oral tablet) a day, and this is sufficient to prevent vertigo, while the acute attack is treated by a hypodermic injection (0.1 gram hypodermic tablet), which will almost at once relieve the patient.

Gastric Hyperacidity ?

(Abstracted from the *Journal of the American Medical Association*, Vol. XCVI, No. 26, June 27th, 1931, p. 2199)

A few years ago it was quite common to hear the term 'hyperacidity' used by clinicians with reference

to the composition of the gastric contents. There is an implication in the term that the acidity of the gastric juice itself is subject to variations in acid concentration as it is secreted; in other words, the fluid emerging from the gastric secretory cells might be equivalent to 0.1 per cent. of hydrochloric acid, for example, at one time and to 0.4 per cent. at another. Obviously, unless the uncontaminated secretion was analysed such a conclusion could scarcely be warranted. Adventitious substances, such as swallowed food or saliva, or mucus might dilute or neutralize the pure secretion and change the composition of the material analysed. Hence the discussions became more guarded. A hyperacidity of the gastric contents, it was pointed out, is not necessarily due to a corresponding increase in the acidity of the secretion poured out by the mucous membrane. Pure gastric juice obtained from a fistulous opening into a normal stomach and not mixed with food usually showed a much higher acidity than is ordinarily found in gastric contents, the total acidity of the pure human juice being reported to range from 0.35 to 0.56 per cent. in terms of hydrochloric acid. Fifteen years ago Hewlett, for instance, pointed out that while hyperacidity of the gastric contents may possibly be due to the secretion of a more acid gastric juice, it may also be caused by the secretion of unusual quantities of a normal gastric juice or by a failure on the part of some of the agencies that normally dilute or neutralize the gastric contents. The clinical differentiation of these various factors is not easily made; but animal experimentation as well as observations on men with gastric fistulas has shown that pure gastric juice possesses an acidity that is rarely approached and never exceeded by the gastric contents in conditions of hyperacidity. It seems probable, Hewlett concluded, that the latter is due not to the secretion of an unusually acid juice but to the secretion of a normal juice in excessive amounts or to an insufficiency in some of the neutralizing factors.

Textbooks of to-day accordingly tend to identify hyperacidity with hypersecretion, admitting that this is brought about not by concentration of the gastric juice but by production of a larger volume of fluid. Hyperacidity, or hyperchlorhydria, thus becomes identical with hypersecretion after ingestion of food. Many years ago, in 1910, the Russian physiologist Pavlov ventured the conclusion—it was merely a hypothesis—that the gastric juice as it flows from the gastric glands possesses a constant acidity. This has repeatedly been affirmed and occasionally denied. The German physiologist Rosemann upheld the theory that the chloride ion brought to the gland is secreted at a definite fixed concentration, part of it unchanged as sodium chloride and part converted into hydrochloric acid, and that the extent of this change governs the acidity of the secreted juice.

It might be assumed that 'pure' gastric juice could readily be obtained by use of a stomach tube. All such mechanical devices are likely, however, to promote a production of mucus which will combine with the acid and alter the gastric acidity. Hollander and Cowgill appear to have mastered the difficulties in experimental animals by collecting the secretion from isolated gastric pouches without any irritation or contamination. It is clear from their convincing data that variations in the rate of secretion are not of necessity accompanied by corresponding changes in acidity. The value of the maximum acidity in pH units was 0.91 ± 0.02 . There seems to be an agreement among all species studied. Deviations from this maximum are ascribed to contamination of the secretion of the parietal cell by that of the mucus-forming and peptic cells. A lymph transudate and epithelial detritus may perhaps play a minor part. The authors advance the view that the chemical mechanism by which the acidity of gastric pouch juice is reduced depends on two factors: (1) a simple dilution by fluids (mucus, peptic secretion, etc.) containing a large concentration of neutral chlorides, as a result of which acidity is reduced much more than is the total chloride content; (2) an actual neutralization

by the bicarbonate in at least one of the fluids, as a result of which there is a further marked reduction in total acidity. Mucin probably plays only a minor part in this second process. The hypothesis regarding the constant acidity of the secretion of the parietal cells seems now to be amply substantiated. The word hyperacidity ought to be dropped from clinical nomenclature.

Ultraviolet Light, X-Rays and Radium as Therapeutic Agents

By P. MacCARVILL

(Abstracted from the *International Medical Digest*, Vol. XVIII, No. 6, June, 1931, p. 338)

It is claimed for sunlight that it cures all diseases from A to Z, i.e., acne to zoster. Experienced dermatologists make no such claims. In the treatment of lupus vulgaris it is of immense benefit. Many cases clear up without using the water-cooled lamps for local treatment. The percentage of cures has increased from 60 per cent. by the old local Finsen light method to 90 per cent. by the combination of general and local treatment. It often happens that the lupus is too much inflamed to allow the light to fall upon it, yet it improves when the body is irradiated and the actual lupus patch covered. This action takes place through raising the patient's tuberculo-opsonic index and not from any local effects.

Generally speaking, it is useful in raising the patient's resistance to staphylococcal infections such as furunculosis and sycosis barbae. In ringworm it is quite useless, and its employment in scalp ringworm can only be described as foolish. The parasite is in the hair. The parasitocidal rays employed locally could not affect it unless one used a blistering dose, thereby bringing out the hairs in the inflammatory process. If mothers will consent, there are simpler methods of producing blisters which require no elaborate apparatus. In ringworm of the scalp it is valuable for diagnostic purposes. By using a special filter which allows through ultraviolet rays of certain wave lengths only, the ringworm parasite fluoresces in the affected hair. The appearance is quite striking and there are no fallacies. In psoriasis the light is disappointing. The prognosis in regard to recurrences is no better than with any other remedy. In the so-called eczemas it has a very limited field, and is sometimes very harmful. In acne it is also disappointing. In diseases such as lupus erythematosus it is dangerous. Even in the chronic fixed cases it may result in lighting up an actively spreading disease. If used at all the patches should be protected, and general irradiation given to unaffected parts. It has been stated that it is an infallible cure for baldness if only the patient will persevere and continue long enough. That leads the author to the conclusion that were it not that life is so short there would be no baldness. Undoubtedly in some cases of recent baldness it is effective. In alopecia areata one can sometimes succeed with it when other remedies fail, but alopecia areata is a rather capricious disease, and he will be wise who will not claim any remedy as infallible when dealing with it. Ulcers are much better treated by small stimulating doses of x-rays.

In surgical tuberculosis the results are sometimes brilliant. Tuberculous lesions of bones, joints, glands, and peritoneum clear up in a remarkable manner. It is obvious that the action of the rays in these cases is not local since they do not penetrate at all to the seat of the disease. In tuberculosis of the lungs the treatment is very dangerous. It sometimes lights up an old healing patch into an actively spreading one.

Rickets and its attendant conditions, spasmophilia and tetany, are markedly improved.

It is here impossible to go into details of the many diseases in which ultraviolet light is advocated. Sufficient has been said to indicate that like most other reputable remedies it has a field of usefulness—a usefulness that is valuable. To recommend it for

everything is to reduce it to the level of a quack remedy and bring it into disrepute.

The question of vitaglass is one which should be mentioned. Ordinary glass cuts off all but a negligible quantity of ultraviolet light. The glass known as vitaglass permits a considerable quantity of it to pass. It is, therefore, urged that it be put in city offices, in hospitals, in the factories, in fact, everywhere that humanity is gathered in glass lighted rooms. One is shown vitaglass in a factory or warehouse and the source of the ultraviolet light with which it is demonstrated is an artificial one. There is no question but the glass allows the ultraviolet light through in these circumstances. But examine it under working conditions. In the first place, dust and soot particles combined with smoke pull out off the ultraviolet rays from our cities. It is not claimed for vitaglass that it attracts ultraviolet light, nor that it can draw it through this pall. Where then is the use of installing vitaglass to admit rays which are not present? Even suppose they were, it has already been pointed out that a thin smear of vaseline is not penetrated by them. If the quartz burner of a mercury vapour lamp gets soiled, the ultraviolet light is cut off. Then how are windows glassed with vitaglass to be kept sufficiently clean to allow ultraviolet light to pass? For city purposes vitaglass is quite useless and does not warrant a single penny of expenditure. If the day is good and there is any ultraviolet light reaching the earth, open the ordinary window and let it in. When out for lunch spend the extra ten minutes in the street and you will get more ultraviolet rays than you would get in 24 hours behind vitaglass.

Housing and Malaria

(A Critical Summary of the Literature dealing with this Subject)

By CLAYTON LANE, M.D.

LIEUTENANT-COLONEL, I.M.S.

(Abstracted from the *Health Organisation, League of Nations*, Official No.: C.H./Malaria/169. Geneva, June, 1931)

THIS report follows a request from the Medical Director of the League Secretariat for a 'survey of available literature in regard to the question of housing and malaria in the form of a critical summary'.

The second general report of the Malaria Commission of the League of Nations describes as indispensable two 'primary measures' directed against malaria, the first being the treatment of the infected. The report states that the other primary measure which was recommended was described in the former report as follows:—

'The instruction of inhabitants.....as to how malaria is spread from member to member of the same family by the agency of particular mosquitoes which find the house a safe resting-place..... In Europe, the majority of infected mosquitoes are found inside houses..... The Commission strongly recommends that.....an active and energetic endeavour should be made, wherever possible, to induce householders, especially housewives to make the killing of adult mosquitoes found within the house a part of the daily cleaning task. The Commission is convinced that that measure, if it could be effectively carried out, would have very remarkable results'.

That conclusion clearly implies the steadfast conviction that malaria infection is essentially obtained in the house in Europe. In effect, the present survey of literature has resolved itself into the collecting and weighing of the evidence bearing on a possible connection between malaria and the house in all parts of the world.

It early became apparent that the amount of published works containing direct evidence of the rôle of the house in the transmission of malaria was relatively small, and it became equally clear that this was the case because there was assumption, often apparently unconscious, that the connection was real and essential. Thus the

fact that nearly all collections of anopheles reported in connection with malaria have been made in houses or outhouses; that in malarious countries the screening of houses is habitually advocated, or their removal to a distance from anopheline breeding-places or sources of malarial infection, while the place of the day's work is unaltered—all these procedures at bottom assume that it is in the house that malarial infection is acquired. In face, then, of this assumption, the amount of evidence is not great, but such as exists seems to me to be strikingly strong. It is considered below from a number of aspects.

Conclusions

The matter may be summed up thus:—

The anopheles associated by experience in the transmission of malaria are in the main house-haunters and night-biters, circumstances which make it likely that the house is important in the transmission of malaria. This likelihood is increased by the consideration that throughout that part of the world where malaria can be transmitted there are 'malarious houses', houses where inhabitant after inhabitant acquires malaria. These houses have certain characteristics, at least in Europe; they possess dark, dirty and often damp portions. In parts of Europe and in indigenous dwellings in the tropics, a chimneyless fire is efficient in driving away anopheles from places which would otherwise suit them, and it is suggested that this condition in the past must widely have influenced the incidence of malaria in Europe; with the invention of the chimney it needed the further institution of ample lighting before houses again became distasteful to anopheles. There is slight, though disputed, evidence that *A. maculipennis* may actually breed inside houses; it appears established that *A. stephensi* will do so in Bombay. It is the case that infected anopheles may be particularly associated with certain houses, and the question has been considered as to whether these mosquitoes have an instinct to return to a pleasant hospice after they have left it to oviposit. Such evidence as exists for an instinct of this kind is questionable; the facts are perhaps explicable as showing a tropism towards food, and, if so, they emphasise the importance of abolishing breeding-places near houses, so that no house shall become established as a malarious one by virtue of being near enough to a breeding-place to exercise a food taxis on an infected ovipositing anopheles looking for her next meal. Certain species of anopheles leave the house where they have fed immediately after feeding, others remain in it for some hours. There is, however, at least in Europe, Northern America and Brazil, a condition of gonotropic dissociation, when the need to oviposit ceases, while the need to feed does not. Mosquitoes in this condition remain in the house where they have fed, and they are capable of becoming malarious and of transmitting malaria. There is some evidence too that anopheles may become sick of malaria, an added reason for their failure to leave the house where they became infected. The effects of aestivation in this direction are unknown. The kind of blood meal which has been consumed by anopheles caught in houses shows that they are not tied to any particular feeding-place, and an anopheles caught in a house has often had her previous meal from some animal outside it; as to the converse, there appears to be little evidence, though that is the point which would here be important. There is no satisfactory evidence that malaria-carrying anopheles prefer the blood of animals to that of man, or that airless animal houses near human habitations necessarily protect man from the bites of anopheles and so from malaria. It is suggested by inference that to house man well is likely to prove a better anti-malarial measure than to house animals badly. There appears a tendency to forget that in the early days of the construction of the Panama Canal, the destruction of replete anopheles in houses was held with good reason by those concerned, from Surgeon-General Gorgas downwards, to have proved a most effective anti-malarial measure; for hibernating mosquitoes this

measure has been as emphatically advised; the success attending the application of these measures stresses the connection between the house and malaria. The value of the screening of houses was established once and for all by the experiment designed by Sir Patrick Manson in the Roman Campaign to test his mosquito-malaria theory in 1900. Its success showed that, if anopheles were prevented from entering houses, malaria could be avoided; the work of others has since shown that even imperfect screening is of value in this direction. These experiments are all evidence that it is in the house that malarial infection is essentially obtained. The relationship of house sites to anopheles breeding-places, the manner in which malarial infection can be fostered or hindered by housing men near to or far from such breeding-places is again evidence in the same direction.

These various lines of investigation press with cumulative force the conclusion that the house is a factor of primary importance in the acquisition and spread of malaria.

Reviews

MODERN MEDICAL TREATMENT. In Two Volumes.
—By E. Bellingham-Smith, M.D., F.R.C.P. (Lond.),
and Anthony Felling, M.D. (Cantab.), F.R.C.P.
(Lond.). London: Cassell & Co., Ltd. Price,
30s. net the two volumes

Books on medical treatment are of two kinds; one is a dictionary in which the different methods of treating specific diseases are enumerated and which are little more than a collection of facts, the other is a treatise on various subjects in which the subject of treatment is given a prominent place, but in which there is sufficient reference to ætiology and diagnosis to make the *rationale* of the treatment clear.

The former should never be allowed to get into the hands of an undergraduate student, whereas the latter will form an excellent complement to his standard medical textbooks in which the subject of treatment is usually, and often quite rightly, given a minor place. Bellingham-Smith and Felling have written a book on medical treatment which is quite definitely of the second variety.

The introduction by Sir Humphry Rolleston is not the usual laudatory effusion written by the great man in order to ensure the satisfactory launching of the work of his junior, but it forms an important and integral part of the whole book. In a few words he gives us a summary of the origin and aims of our present-day prevention and treatment of disease, and indicates the lines along which advance may be expected.

In the arrangement of the book the 'system' method has been more or less observed, but the order of the subjects is somewhat unusual, 'Diseases of the Nervous System' being the first section.

In the proportioning of space to the various subjects the interests of the general practitioner have been kept well in view; for example eleven pages are given to the treatment of insomnia—a subject which is likely to be slurred over in an ordinary medical course—whereas the authors have not attempted to expatiate at any length over our failure to find any specific treatment for the academically more interesting Addison's disease.

Again, we are glad to see that the authors have not been lured into writing at any length on tropical diseases; they have tackled malaria, amoebiasis and schistosomiasis only, and, although this section is perhaps not quite up to date, it is at least free from the glaring inaccuracies which so often disfigure books on general medicine.

The whole work is well balanced, concise and pleasant to read. Many useful prescriptions are to be found in the pages and the subject of the general management

of the patient is always dealt with in a practical manner. The division into two handy volumes was a wise decision, and, speaking as one who always finds that the index is in the *other* volume, the reviewer considers that the extra cost of printing the complete index at the end of each volume was money well spent.

We can strongly recommend this book to students and practitioners in this country; at Rs. 20 for the two volumes, it would be hard to find better value.

L. E. N.

THE MODERN TREATMENT OF HÆMORRHOIDS.—

By J. F. Montague, M.D., F.A.C.S. Foreword by H. Brooks, M.D., F.A.C.S. Second Edition. Revlsd. London: J. B. Lippincott Company, 1929. Pp. ix plus 298, with 116 illustrations. Price, 21s. net. Obtainable from Messrs. Butterworth Company (India), Ltd., Calcutta. Price, Rs. 15-12

THE second edition of this book has appeared within a year of the first edition, which in itself is evidence of its popularity. The author states that there are few changes in the new volume; among these are a further report on the results of radium treatment of hæmorrhoids, and charts to illustrate the bearing of such factors as age, sex, occupation and heredity on the incidence of the disease.

A review of the first edition appeared in the *Indian Medical Gazette* of May 1928 (Vol. LXIII, p. 280), to this the reader is referred for further details regarding the present volume.

F. P. C.

A CLINICAL STUDY OF ADDISON'S DISEASE.—By

L. G. Rowntree, M.D., and A. M. Snell, M.D. Philadelphia and London: W. B. Saunders Company, 1931. Pp. 317. Illustrated. Price, 18s. net

THIS is a particularly useful type of monograph; it is neither a voluminous treatise on the subject, nor is it a mere analysis of collected cases, but it is a well-balanced record of experience, both personal and that imbibed from the writings of others.

As the authors have observed, Addison's original description of the disease is one of the greatest English classics in medicine. Surprisingly little has been added to our knowledge of the disease during the last 75 years; for this reason the reprinting in full of Addison's original paper is more than justified.

The clinical description in the volume under review is based on 108 cases; of these 31 came to post-mortem. Of the 31 cases, six were not diagnosed during life. The clinical and pathological records of these 31 cases is dealt with separately. This is extremely satisfactory as, however typical clinically a case may be, there is no method of absolutely clinching the diagnosis during life, and without the correcting influence of the post-mortem room there is always a danger that a false picture will be conceived in the physician's mind.

The subject of treatment is not an inspiring one, but the authors have made the best of it. They seem to have great faith in the future of Swingle and Pfiffner's cortical hormone, though their experience with it is very limited.

The only criticism that the reviewer has to offer is that sufficient use does not appear to have been made of the biochemist in investigating the suprarenal function in the cases reported. He also feels that we have not really got a complete picture of the ætiology of this disease yet—this is no fault of the authors. Why is it, for example, that, though the endocrine deficiency in the case of diseases of most other glands can be supplied therapeutically, so effectively, the treatment in this disease is so unsatisfactory? Perhaps Swingle and Pfiffner have supplied the answer.

The format of the book is excellent. The printing, paper and binding are good, and there are a number of useful coloured illustrations.

L. E. N.

OPERATIVE SURGERY: GENERAL AND SPECIAL CONSIDERATIONS.—By Dr. M. Kirschner. London: J. B. Lippincott Company, 1931. Pp. xi plus 666, with 746 illustrations, mostly coloured. Price, 50s. net. Obtainable from Messrs. Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 37-8

WITH so many excellent books on surgery available in the English language it is difficult to justify the translation of a book from the German. However, after reading the book under review we are compelled to admit that there are exceptions to the rule, and to congratulate Professor Ravdin (the translator) on being given an opportunity which he has turned to such very good account. From a number of points of view this book is outstanding. There are 746 illustrations, mostly in colour. Now, over-illustration is, in our opinion, the besetting sin of American publishers and authors, but in this particular instance it is almost impossible to find one illustration that is not relevant.

The volume does not cover the whole range of surgical operative procedure, but it discusses aspects of the subject which are frequently neglected in textbooks, and it gives minute details of technique which should be invaluable to the young student and which the experienced surgeon will often find of the greatest help in improving his technique.

After an opening chapter of introductory considerations, which includes the general examination and management of the patient, and general principles of operative technique, there are chapters on anaesthesia, control of infection, and control of hæmorrhage; then follow six chapters on operations on the skin and subcutaneous tissues, muscles, tendons and fascia, blood vessels, nerves, bones, and joints, and there is a final chapter on amputations and disarticulations.

One of the best chapters is that on anaesthetics. The illustrations in this section alone make the book a valuable one; nerve-block anaesthesia in various regions is depicted so clearly that the most inexperienced should be able to grasp the technique in a very short time.

The budding surgeon could not do better than purchase this book: he will find it an invaluable guide for many years, and by the time that he puts it aside either he will have become a great surgeon, or he will have remained a great fool.

The printing, the paper, and the reproduction of the illustrations are of the excellent quality that we have been taught to associate with this firm of publishers.

SURGICAL PATHOLOGY OF THE DISEASES OF BONES.—By A. E. Hertzler, M.D. London: J. B. Lippincott Company, 1931. Pp. xiv plus 272, with 211 illustrations. Price, 21s. net. Obtainable from Messrs. Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 15-12

It is stated in the preface to this book that it is the only volume so far published dealing only with the surgical pathology of the diseases of bones. The need for such a book was obvious, and as no one had yet made any effort to produce one, Dr. Hertzler undertook the task; he tells the story entirely from his own cases, and as far as possible by the means of pictures.

The book opens with a broad classification of the diseases of bones as follows:—1. Inflammatory. 2. Of obscure origin. 3. Neoplastic.

A further subdivision leads to a very extensive classification which is chiefly the author's own. Kolodney's classification of the neoplastic diseases is, however, followed, and the osteogenic sarcomata are subdivided according to Ewing.

Then follows a description of the inflammatory conditions in which the supreme importance of good skiagrams is emphasised, and the differential diagnoses of many of the less common inflammatory diseases are clearly defined.

Under the heading 'diseases of obscure origin' are included such conditions as Perthes' disease, Osgood-Schlatter's disease, achondroplasia, etc. This is a

somewhat disappointing section as all the conditions included in it are scantily described.

The section on neoplastic diseases is good, and contains an excellent description of Ewing's tumours. With regard to the latter, Dr. Hertzler remarks that there are less than a dozen people in the world who understand this group of tumours, a point of view which might excite some controversy.

The bibliography at the end of each chapter contains a brief statement of what is discussed in the article referred to; this is a welcome innovation.

This book is well worth adding to one's surgical library.

H. E. M.

THE PRACTICAL TREATMENT OF DIABETES.—By T. Izod Bennett, M.D. (Lond.), F.R.C.P. (Lond.). London: Constable and Company, Ltd., 1931. Pp. ix plus 107. Price, 6s. net. (Available from Oxford University Press, Bombay)

THE successful treatment of diabetes mellitus depends, to a large extent, on the *intelligent* co-operation of the patient and his family with the physician; to achieve this object an intelligent understanding of the character and nature of the malady is a great help to the patient himself. It is encouraging to find that workers on the problem of diabetes have realized this, and Dr. Bennett's book is a useful addition to that long series of books designedly written with this object in view. Not only educated patients, but junior practitioners as well, will be benefited by the practical descriptions of the modern treatment of diabetes given in this book.

There are a few points in the book which perhaps require reconsideration. For instance in figure 3 (page 22) the author gives a diagram representing the effect of the different meals during the day on the blood-sugar curve of a *normal* healthy individual; the small but steadily-continuous rise of blood-sugar extending for a period of three hours after taking breakfast and its slow fall during the next two hours, appear to us to be distinctly *abnormal*. Then, again, at lunch time (about 5 hours after breakfast), the blood-sugar in the chart is still shown to be much above the pre-breakfast level, which again, in our opinion, indicates *defect* in the storage mechanism of the system. The same process is shown to occur throughout the day and the only occasion when the blood-sugar is shown to come back to the pre-breakfast level is about midnight, *i.e.*, 17 hours later! This chart appears to us to be somewhat misleading; we hope the author will revise it in the next edition.

In chapter II the author deals with the general principles in the treatment of diabetes, calculation of diet, etc. We note that a few minor inaccuracies have crept into the diet tables. For instance, in the second diet (page 40) the food value of four ounces of fried tomatoes has been shown as carbohydrate—5 grammes, protein and fat—0.5 gramme, whereas in the eighth diet (page 45) the same (this is put down there as 'potatoes', but the author has corrected it to read as 'tomatoes' in an erratum slip) is shown as having a value of carbohydrate—0, protein—1 and fat—0 gramme. We take this to be an oversight, and hope to see it corrected in the next edition.

We are of opinion that the book gives very clear practical details about the treatment of diabetes which will help the young practitioner in giving necessary instructions to his diabetic patients, who should be able, also with the help of the book, to follow the instructions intelligently in making suitable selections of diet to meet their special requirements.

J. P. B.

NUTRITION AND DIET IN HEALTH AND DISEASE.—By James S. McLester, M.D. Second Edition. Philadelphia and London: W. B. Saunders Company, Ltd., 1931. Pp. 891. Price, 36s. net

It gives us genuine pleasure to have to review the second edition of Dr. McLester's book; the first edition

we reviewed about 3 years ago. It may be considered to be one of the standard books on nutrition.

The science of nutrition is undoubtedly engaging increasing attention on the part of the general public, and is already occupying a large space, not only in the practice of medicine but also in surgery and midwifery. It is, therefore, gratifying to find that within the last few years much advance has been made in the development of this subject and the knowledge of its principles is now more widespread among general practitioners than at any time before.

As before, the author has ably dealt with the nutritional aspect of health and disease in all its important bearings, physical, physiological, pathological, experimental and economic.

Many additions and changes have been made in some of the chapters, specially in the discussion of some of the metabolic diseases, such as diabetes, gout and obesity, in accordance with the modern ideas on the subject. Chapter XXI, dealing with the diseases of the blood, has been practically rewritten in view of the fact that much interesting work has been done recently on the classification of the nature of anæmias which necessarily affects the line of treatment. The recent work of Douglas and Tannenbaum on the mechanism of secondary anæmias has been incorporated in the book; this work shows that the measure of the bone-marrow activity depends on the reticulocyte count, because the appearance of reticulocytes in the circulating blood indicates that the erythropoietic system is active, also that the blood destruction can be measured with a fair degree of accuracy (in the absence of liver disease) by the icteric index.

The section on vitamins has been considerably enlarged in view of recent discoveries, specially the work of Smith, Hendrick, and Goldberger on pellagra which has resulted in the identification of vitamin G as an indispensable food factor, the lack of which from one's diet produces pellagra. Previously it was recognized that the vitamin B complex had mainly two indispensable principles—the antineuritic fraction as distinct from the heat-resisting P. P. (*i.e.*, pellagra preventive) fraction. The latter fraction, according to the recent work of Goldberger, is now known to be identical with vitamin G, which is contained in yeast, milk, tomatoes, bananas, eggs, meat, etc. The author however, does not seem to accept Goldberger's view unreservedly, and seems to be of opinion that, though vitamin-G deficiency may be a predisposing factor, the ultimate cause of pellagra is an infectious agent.

The section on the mineral requirement of the body has also been much enlarged. The question of availability of inorganic salts for nutritive purposes has been a subject of interesting controversy. The author has given us an able discussion with reference to the recent works of numerous investigators on the subject, which is most certainly worthy of perusal.

The section on the protein problem is a very interesting study. The author has discussed in some detail the practical side of the protein requirement of the body and after discussing the views of the two opposing schools of thought, *viz.* the German school headed by Viogt, advocating high protein diet, and the American school headed by Chittenden, advocating low protein diet, has come to the conclusion that 'to enjoy sustained vigour and to experience his normal expectancy, man must eat a *liberal* quantity (*i.e.*, in excess of his "theoretic" needs, say 100 grammes daily) of good protein (*i.e.*, protein of high biologic value, such as milk and meat)'. It may be mentioned here that investigations into the dietaries of some of the races in India conducted by McCay, McCarrison and others support the author's conclusions as to the importance of a liberal supply of good protein in the daily diet for the maintenance of health, strength and the resisting power against infection. The poor health of the people of some of the provinces in India, in our opinion, is due to chronic protein starvation.

A few new sections have been added, with considerable advantage to the reader, the most important

amongst them being the toxæmias of pregnancy, protozoan infections of the bowels, etc.

The book gives a fairly exhaustive account of the scientific foundations on which our present knowledge of nutrition in health and disease has been built up. The addition of a bibliography at the end of almost every chapter is very welcome, because it serves as a guide to those who wish to amplify their knowledge on the subject. We have no hesitation in saying that the book is a valuable contribution to up-to-date knowledge on the subject and should prove to be a standard work of reference to those engaged in the problem of nutrition and diet, in health and disease.

J. P. B.

MEDICINE: ANALYTICAL REVIEWS OF GENERAL MEDICINE, NEUROLOGY, PEDIATRICS. May Issue, 1931, Vol. X, No. 2. Baltimore, U. S. A.: The Williams and Wilkins Company. (English Agents are: Baillière, Tindall and Cox, London.) Price, 21s. per volume, and postage 2s. 6d. net. Single copy, 6s. 9d. net.

We have had the opportunity of reviewing many previous issues of 'Medicine'—the quarterly journal published by the Williams and Wilkins Co., Baltimore, and we have had nothing but praise for the useful and informative articles appearing therein. It is very gratifying to see that the present number (Vol. X, May 1931) has not departed from the standard set by others of the series. The chief article on nephrosis is an admirable compilation from the Department of Medicine, University of Chicago, and will fully repay careful study. The term 'nephrosis' came into the field comparatively recently (1905), and from that time onwards there has been a diversity of opinion about its significance. So many different theories have been put forward from time to time by eminent clinicians and pathologists in various countries regarding its causation that it is very difficult for the ordinary medical man to form a clear image of the disease. In this article a comprehensive review of all available literature has been made and sufficient evidence has been produced in favour of the existence of the disease, as a definite clinical and pathological entity, in contra-distinction to the nephrotic syndrome in chronic glomerular nephritis.

The second article, on 'the influence of local factors for electivity in central nervous system disease processes', is the address of Professor Walther Spielmeier of Germany before the Boston Society of Psychiatry and Neurology. This seems to be too abstruse for the general reader, but will give plenty of food for serious thinking to those interested in neurology.

R. N. C.

THE PHYSICAL AND RADIOLOGICAL EXAMINATION OF THE LUNGS.—By James Crockett, M.D., D.P.H., F.R.C.P.E. Second Edition. London: H. K. Lewis & Co., Ltd., 1931. Pp. x plus 296, with 151 illustrations, including 40 plates. Price, 16s. net.

It is a great pity that the title of this book is misleading and that the book is not as comprehensive as the title suggests. The material that is in its pages is, however, excellent and brings out many points not usually noted in the examination of chests. The title-page modifies the title a little by adding 'with special reference to tuberculosis and silicosis, including a chapter on laryngeal tuberculosis', but for any student to read through the book and find the pneumonias dismissed in about 16 lines and then only in a comparison with phthisis is disappointing. In the same way, bronchitis, pleural effusions, and new growths have hardly been mentioned. The methods and principles of the examination of a patient are so well gone into that it would probably mean only two or three more short chapters and a few accompanying radiograms to remedy the matter, and to make the book a textbook suitable for any student or practitioner renewing his acquaintance with medicine with special regard to chest

complaints. As it is, tuberculosis and silicosis have been gone into very fully and other pathological conditions have scarcely been mentioned.

To any practitioner specialising, or contemplating specialising, in tuberculosis the book is ideal—we have here in one book the anatomy, physiology, and applied physiology of the chest, together with full clinical and radiological methods of examination and technique. The radiological section is particularly useful to the clinician who has to interpret his own films, and the reproductions of radiograms are good and well repay careful study.

A little point, but one which if attended to would make for increased pleasure in reading, is that where references to 'figures' have been made the page number has been omitted. This is especially noticeable in the anatomy section. It is not conducive to thorough or pleasant study to have to hunt laboriously through page after page of the book to find the required diagram which may be, and in several cases is, 100 pages further on in the text.

The glossary at the end of the book of terms used in connection with the lungs is an excellent idea and one that might well be copied by authors of other textbooks.

J. F. C.

ELEMENTS OF EMBRYOLOGY.—By Dr. Hyderali Khan, F.R.C.S.E. Allahabad: The Indian Press, Ltd., 1931. Illustrated. Pp. 104. Price, Rs. 5

This small book on embryology deals with the developmental history in a concise manner, stating the accepted up-to-date views in a plain and simple style. It begins with the animal cell, fertilisation and segmentation, and then deals with the development of the systems one after another. At the end there is a description of the embryos and foetuses at different periods of development. The book is meant not for those who intend to make a special study of the subject—for these reference to more elaborate textbooks is necessary—but for the students who require an elementary knowledge of the subject; for these the book is extremely suitable. It is also suitable for quick revision of the subject, as all the important facts have been incorporated in it in a concise manner. The book contains many illustrations some of which are in colours. There are some typographical errors which are expected to be rectified in the next edition.

N. P.

LASCAR HINDUSTANI FOR SHIP-SURGEONS.—By S. Chalmers Parry, M.A. (Cantab.), M.R.C.S., L.R.C.P. Second Edition. London: W. J. Clark and Co., Printers, Hanway Street, W.1. 1931. Pp. 48. Price.—Paper covers, 2s. 6d. net; Cloth bound, 3s. 6d. net.

ANY European medical man practising in India will find this little book very helpful. It is written primarily for the ship's surgeon, but the essentially nautical terms are easily outnumbered by the essentially medical terms. To the tea-garden doctor it will be more useful than the ordinary 'Aid to Conversation in Hindustani' which is to be found on the railway station bookseller's stall. Sentences such as 'I want four coolies to take my baggage to the hotel' may be very useful to the tourist, but the doctor will find the more prosaic '*Arj kitna tutti hooa hi?*' much more practical.

SPA TREATMENT.—Compiled and published by The Harrogate Medical Society

THE Harrogate Medical Society have issued a very useful booklet under the name of 'Spa Treatment'. Actually the subject is only dealt with from the point of view of the Harrogate doctor. Nevertheless it contains much useful information of general application. The book is meant for the doctor and not for the patient. A list is given of the various diseases and conditions which are likely to be benefited by spa treatment, and we are relieved to see that considerable

restraint was used here—no extravagant claims are made. The list concludes with 'after-effects of tropical diseases'. Again we must applaud the extreme moderation of this undoubtedly justifiable claim—such a pleasant contrast to the unjustifiable and unethical statements made regarding so many spas—though we hope not by members of the medical profession. The book contains much other interesting and valuable information, and we strongly recommend any doctor who is in the habit of sending patients to Europe, to obtain a copy of this book by writing to the secretary of the Harrogate Medical Society.

BAILLIERE'S SYNTHETIC ANATOMY.—By J. E. Cheesman. Part XI.—Perineum.—(Male) and Part XII.—Perineum.—(Female). London: Baillière, Tindall and Cox. Price, 3s. net each

We have received parts XI and XII of Baillière's 'Synthetic Anatomy'; these deal with the male and female perineum. Although the first ten parts of this anatomy covered the whole body, the two new parts are an important complement. A large-scale view is given in both male and female perineum and, as they are viewed from the same angle, *i.e.*, from almost directly below upwards, the two parts can be compared and contrasted.

The views of the pelves are taken from the opposite direction, *i.e.*, from above downwards, and are included to complete the conception of the perineum from above as well as below, rather than as a separate introduction to the study of the pelvis.

The measurements of the outlet and cavity of the female true pelvis will be found to fall within the normal scale, but the antero-posterior diameter of the pelvic inlet is obviously fore-shortened on account of the obliquity of its plane with the horizontal. This will be sufficiently evident on inspection of the drawings as will also be the fact, sometimes lost sight of in antero-posterior aspects of the pelvis, that the sacral promontory lies almost directly above the central point of the perineum.

We strongly recommend these atlases to students in this country.

MEDICINE: ANALYTICAL REVIEWS OF GENERAL MEDICINE, NEUROLOGY AND PEDIATRICS. Volume X, No. 3, September, 1931. Baltimore, U. S. A.: The Williams and Wilkins Company. Pp. from 257 to 371. Price, 21s. per volume, and postage 2s. 6d. net. Single copy: 6s. 9d. net. (English Agents are Baillière, Tindall and Cox, London)

THIS number contains two short monographs, or perhaps, as they only deal with one particular aspect of their respective subjects, they should be referred to as articles; they are: 'A new conception of the morbid changes in diseases of the thyroid gland, based on experimental studies of the normal gland and the thyroid in exophthalmic goitre', by William Francis Rienhoff, Jr., and 'The clinical implications of experimental hæmatology', by Charles A. Doan.

Let us deal with the second article first. From the point of view of the pure clinician we feel that this article may be disappointing. The writer stresses the importance of a complete investigation of the cellular picture in all diseases, but rather from the point of view of the research worker than of the clinician who wants to make a definite diagnosis in the particular case under investigation. If anything he rather emphasises the limitation of the conclusions that can be drawn, from a single total blood count, for example. He points out that the normal diurnal range of the leucocyte count is so great that the maximum is twice the minimum, that is to say, if a blood count at any particular moment shows 5,000 cells per c.mm., this may be the minimum, in which case the maximum will be 10,000 per c.mm., or it may be the maximum in which case the minimum will be 2,500 cells per c.mm. This does not encourage the clinician to place much reliance on a single blood count. This is perhaps all to the

good; if he is in a position to have a series of counts done, he will, we hope, have them done, if he is not, it is just as well that he should know where he is and not be led astray by a single count.

Anyone trying to keep in touch with modern hæmatology will find the article invaluable; it gives an excellent picture of the modern trend in this branch of science, a good résumé of the most recent advances, and a useful select bibliography.

The other article deals with its subject from a new point of view. It is well illustrated, and constitutes an important contribution to the subject.

L. E. N.

THE RHEUMATIC INFECTION IN CHILDHOOD.—By L. Findlay, M.D., D.Sc., M.R.C.P. London: Edward Arnold and Co., 1931. Pp. vii plus 187. Illustrated. Price, 10s. 6d. net

PROFESSOR FINDLAY presents in this small monograph a critical and analytic review of the subject of rheumatic infection in childhood, based mainly on the personal study of a large number of cases, of which the majority have been under observation for a sufficient number of years to enable him to give a life-history of the young subject of this disease.

By way of introduction the author emphasises the important fact that rheumatism in childhood is a chronic infection with acute exacerbations, and not an acute disease subject to relapses. The student of this disease will appreciate the distinction.

The importance of the subject, both as regards prophylaxis and treatment is illustrated by figures borrowed from the Ministry of Health report of 1924. An examination of 366,000 children revealed the fact that 1 per cent. suffered from heart disease due to rheumatism. As regards the part played by rheumatism in the production of carditis, analysis of 473 cases showed that 96.7 per cent. were due to rheumatic infection though the corroborative manifestations were, in certain cases, delayed as long as four years. Scarlet fever, and to a lesser extent diphtheria, influence the incidence of rheumatic carditis as these diseases predispose to rheumatic infection, but confusion has arisen over the non-rheumatic arthritis appearing in the acute stage of scarlet fever and the septic type of valvular disease appearing at the same time.

On the subject of rheumatic manifestations the author has many interesting things to say, some of which will lead us to reconstruct or at any rate review our conceptions of this disease. He does not accept the frequently-mentioned pre-rheumatic state as clinically recognisable, nor is the old tenet that acute rheumatism is invariably accompanied by tonsillitis left unchallenged. Again, the incidence of primary rheumatic pleurisy is questioned. Of special interest is the note on the tendency of acute exacerbations to remain true to type, that is, chorea to be followed by subsequent attacks of chorea and arthritis by arthritis. Further developing this line, it is found that certain heart lesions tend to predominate according to the type of the other manifestations, that pericarditis, for instance, is associated with arthritis and rarely with chorea. Of nodules he states that they are never seen except in the presence of carditis.

Professor Findlay is inclined to limit the manifestations which may correctly be ascribed to rheumatic infection and regards with some doubt the true specificity of the rheumatic lung, as described by Nairn and accepted by other authorities, or the production of a specific nephritis.

On the subject of prognosis, the gravity of pericarditis is stressed; it is pointed out that cardiac lesions are almost invariably established in the first or second exacerbations and that the second period of maximum mortality of the subjects of cardiac lesions coincides with the age incidence of hyperpiesia.

The importance of correct and adequate treatment is emphasised by the statement that the incidence of heart lesions is twice as high in cases improperly treated. Adequate treatment consists in the main of high doses

of salicylates, grs. 120 or more a day for older children, with rest in bed for a minimum period of three months.

This is a book which should be read by all those who are interested in the subject, not only in Europe, but in India where the incidence of rheumatic infection calls for more attention than has up to this time been bestowed upon it.

E. H. V. H.

DISEASES OF THE STOMACH.—By H. Morton, M.D. London: Edward Arnold and Co., 1931. Pp. vii plus 184. Illustrated. Price, 10s. 6d. net

THIS volume is of the ideal size for a monograph intended for the use of the general practitioner who has not the time at his disposal to digest the large body of literature on the subject that has appeared of recent years. He will find here a concise yet adequate summary of our present knowledge presented in a clear and logical manner. Due place is given to functional disorders, which, contrary to the impression gained from the perusal of current literature, form a large proportion of the cases coming under treatment.

The various forms of disorder of the stomach, organic and functional, the latter grouped under the heading of gastric neuroses, are fully described and a clinical picture of each condition, including notes on the general health and mental outlook of the patient, forms a sound basis for differential diagnosis. Such information as may be derived from gastric analyses and x-ray photographs is added.

The ætiology of each disorder is discussed. Special attention is drawn to the possibility of underlying organic disease elsewhere, as in the appendix and, with reference to gastritis, the importance of naso-pharyngeal or oral infection is stressed. Disorders of the stomach, perhaps more than those of any other organ, are to such a degree due to ascertainable, if not wholly controllable, causes that this ætiological discussion forms an essential preface to treatment. The author has carried the principle through by opening each section on treatment with full directions as to the removal of primary causes, the improvement of the general health of the patient and, where necessary, his surroundings. For the rest, directions as to treatment, medicinal, dietetic or by lavage, are given in full and the indications for surgical assistance are outlined. At the end of the book the chief tests required for the laboratory investigation of gastric disorders are given in detail. The physician will wish to form his own opinion as to the significance of x-ray and analytical findings, and for this reason we could wish for more full instruction as to their interpretation together with tables showing the variations within the normal of gastric secretions.

This is a book which may with confidence be recommended to the student and practitioner. The former will find it of the greatest assistance in getting a clear grasp of the fundamentals of a somewhat complicated subject, and the latter in clarifying and systematising his views.

E. H. V. H.

THE MANAGEMENT OF ABDOMINAL OPERATIONS.—By Rodney H. Maingot, F.R.C.S. (Eng.). London: H. K. Lewis and Co., Ltd., 1931. Pp. xii plus 311. Price, 7s. 6d. net

THIS short book is intended chiefly to provide a reference work for house surgeons and others, who may at any time be in charge of a patient who is awaiting, or who has just undergone, the surgical treatment of the abdomen.

It is therefore purely and simply a description of the routine pre- and post-operative treatment, which is to be found in most textbooks on surgery.

The author has, however, considerably enlarged on the somewhat scanty details given in many of the surgical tomes, and has produced a useful volume in which the treatment of each particular condition is described, as well as the general treatment of abdominal operations.

He is somewhat dogmatic on his own particular method, but states in extenuation that it is better to have a perfect understanding of one method, than an incomplete knowledge of several—a statement with which everyone will agree.

The all-important subject of the anæsthetic is gone into carefully, Mr. Maingot himself preferring ether, or a mixture containing ether, except in special cases.

Those for whom the book has been specially written have here a ready-to-hand reference in which the desired line of treatment can be looked up in a few moments, and so it 'plays its part'.

H. E. M.

ACCIDENTAL INJURIES: THE MEDICO-LEGAL ASPECTS OF WORKMEN'S COMPENSATION AND PUBLIC LIABILITY.—By Henry H. Kessler, A.B., M.D., F.A.C.S., F.A.P.H.A. London: Henry Kimpton, 1931. Pp. xx plus 718, with 157 engravings. Price, 45s. net

THIS book has been written with the object of providing reference and guidance to all those, both medical and laymen, whose daily routine brings them into close contact with the medico-legal aspects of workmen's compensation and public liability. That the author is eminently competent to compile such a work there can be no shadow of doubt, being, as he is, the director of several boards, committees, and rehabilitation clinics in America; in addition to which he has had personal experience of 63,638 compensation cases.

The book teems with masses of statistical tables which are extremely comprehensive, and must have taken an infinite amount of time and labour to collect and tabulate.

The forms in use in the different States of America and in Europe are reproduced, and the proper methods of making claims with the dates by which they must be made, are enumerated. Almost every injury and disease that the human body can acquire is discussed in relation to compensation; even such rare diseases as amyotrophic lateral sclerosis, and pachymeningitis hæmorrhagica interna receiving due consideration.

On reading through the tables dealing with compensation, one is struck by the great lack of uniformity in assessing percentage of disability, and the time for which compensation is payable in the various States. For instance, loss of an arm at the shoulder is assessed in Hawaii at 100 per cent., and in Virginia as low as 30 per cent. Complete deafness, also in Hawaii is rated at 100 per cent., but in Kansas at 24 per cent. The time for which compensation is payable for complete permanent disability is in many States for life, but in Vermont only for 269 weeks. For the loss of an arm at the shoulder the State of Oregon pays compensation for 416 weeks, while in Rhode Island the maximum limit is 50 weeks. From the above it would appear that some type of international board is required to fix a uniform standard.

There is no doubt that this book should prove a 'golden' one for the medico-legal practitioner.

H. E. M.

THE CLINICAL INTERPRETATION OF BLOOD EXAMINATIONS.—By Robert A. Kilduffe, M.D., F.A.S.C.P. London: Henry Kimpton, 1931. Pp. 629. Illustrated with 60 engravings. Price, 30s. net

THE scope of this book is a little wider than its title suggests. It does certainly indicate the significance of the various blood examination findings, but at the same time it describes some of the technique by which the facts are ascertained.

The reviewer was inclined to be surprised at the length of a book on such an apparently limited subject, but he soon found that some of the subjects were dealt with very concisely and that there was little irrelevant matter. The subject is much wider than one first imagines; it includes much of the science of the cytologist, the serologist, the pathologist, the

biochemist, the bacteriologist, the protozoologist, and the helminthologist.

In the sections dealing with the cytology of the blood and the carrying out and interpretation of the various serological tests, more especially the Wassermann, the author appears to the greatest advantage. The chapter on bacteriology is short though useful, but that on parasitology is puerile.

It is the greatest pity that a writer of this standing, presumably in order to complete his subject, should be lured into writing on a subject of which he has no practical experience. For example, under 'Filaria' he has given some scraps of correct information, but these are presented in a way that one would expect from a student with a good memory who had slept through most of the lecture on the subject. The paragraph ends with the illuminating remark 'The presence of filaria in the blood is diagnostic'—of *filaria in the blood*, presumably.

The book is rather uneven; for example there are many pages and five quite redundant illustrations on the erythrocyte sedimentation test—a test which is now well past its zenith of fashion—whereas the Arneth index is dismissed in a few lines and the Schilling count receives little more attention.

These are only a few unimportant defects in a book which both the clinician and the laboratory worker will find extremely valuable; we can recommend it to the general practitioner and the medical student.

The book is well printed, suitably bound, and of a convenient size.

L. E. N.

MALARIA CONTROL BY ANTI-MOSQUITO MEASURES.—By G. Covell, M.D. (Lond.), D.P.H., D.T.M. & H. (Eng.), Major, I.M.S. Calcutta and Simla: Thacker, Spink and Co., Ltd., 1931. Pp. ix plus 148. Illustrated. Price, Rs. 5

MALARIOLOGISTS are already grateful to Major Covell amongst other things for his summary of the infectivity rates of female anophelines. He has placed workers on malaria, especially those engaged in practical anti-malarial operations, under a sense of obligation in this present book. He has in the first place compiled a very complete and up-to-date bibliography of anti-mosquito measures. This is conveniently arranged under general and special heads such as drainage, oils, Paris green, screening, etc., and cross references are given to these items in the text, and in the bibliography to the text pages. The bibliography is, one would say, peculiarly complete and nothing seems to have escaped Major Covell's notice. The text naturally is based on the bibliography. Part I deals with protection against bites of mosquitoes, part II with measures directed against adult mosquitoes, and part III, naturally the largest portion of the book, with anti-larval measures. In part I the reader will find many important details about mosquito netting and wire gauze of which probably he was ignorant or had forgotten. Major Covell recommends Dover's formula (oil of citronella $\frac{1}{2}$ oz., spirits of camphor $\frac{1}{4}$ oz., cedar wood oil $\frac{1}{4}$ oz., white petroleum jelly 2 ozs.) as the most effective repellent for skin application.

In part II the increasing importance now being given to destruction of adult female mosquitoes by hand in houses and homes is stressed. All the various varieties and designs of mosquito traps are described, and their value for estimating the efficiency of anti-larval measures pointed out. Details of the various methods of fumigation are given—Is the author quite right in saying that *formic* acid is evolved when formalin and potassium permanganate are brought together? Formulæ for various sprays are given; on the whole the opinion seems to be that the proprietary preparations are superior to imitations, in that the former kill the mosquito while the latter only stupefy. The cost of the proprietary sprays however is absurdly high and Covell recommends the use of some imitation compositions, the moribund mosquitoes being swept up and

burned. Mansell's spray (carbon tetrachloride 1, synthetic oil of wintergreen 2, kerosene oil, second quality, 97, and naphthalene $\frac{1}{4}$ lb. per gallon) has been used with success. The question of zooprophylaxis would appear not to have been settled yet, judging by the varied opinions quoted.

In part III dealing with anti-larval methods, the author again points out how important is the preliminary survey to determine the species of carrier anophelines present and their breeding places. He gives the opinion that in India anti-larval methods should be undertaken for a distance of half a mile from the periphery of the area to be controlled. The prevailing wind may modify this dictum. The importance of catching stations is insisted on as a means of obtaining information. Trap catches rather than hand collections are advised. A month before the commencement of the malarial season is selected for starting temporary control measures. Temporary means should be discontinued at the end of the malarial season. The pros and cons of jungle clearing are clearly and succinctly stated, *A. umbrosus* and *A. minimus* being cited as instances where indiscriminate jungle clearing proves dangerous. Drainage is a big subject which the author admits cannot be dealt with efficiently in a book of this size. He outlines the main points of the subject however.

Oiling naturally receives detailed attention; this and the section on Paris green will prove of the greatest use to the practical man in the field. Full and practical information about the various oils (proprietary and otherwise), types of sprays, amounts to be used, cost, etc., is given. The high pressure sprays of the 'Four Oaks' type seem to be universally approved. Paris green in Covell's opinion seems to come nearer to fulfilling all the requirements of an anopheles larvicide than any other preparation at present available. (This has hardly been accepted in Bengal yet but more experience and experiment is required.) In drier places it certainly has many advantages. Full details of the preparation, mixing, and spraying are given, and the advantages and disadvantages clearly stated. Biological control is discussed but the Dutch method of treating fish ponds in Java is not described. Experience in Bengal has been we think that the water hyacinth has certainly no preventive effect on malaria but rather the reverse. We wonder if Major Covell has seen a small booklet on the connection of *pistia* with malaria?

Major Covell's book is a valuable addition to the armamentarium of both the practical and laboratory worker in malaria, and we are sure that no such worker will neglect to get a copy. The only criticism we might make is that Major Covell might have expressed his own opinions a little more freely. The advertisements at the end of the book are distinctly helpful in a book of this nature.

A. D. S.

AIDS TO SURGICAL ANATOMY.—By Richard H. Hunter, M.D., M.Ch., Ph.D. London: Baillière, Tindall & Cox, 1931. Pp. 184, with 23 text figs. Price, 3s. 6d. net

THIS little book on surgical anatomy, although not an ambitious one, will serve a useful purpose; it will be helpful to students preparing for the final examination who wish to go rapidly through the important points in surgical anatomy that may be required of them in their examination.

S. N. M.

ELEMENTARY AND ADVANCED TEXTBOOK OF ANÆSTHESIA.—By Dr. K. E. Madan, M.D., D.O.M.S., Lecturer in Anæsthetics, King Edward Medical College, and Senior Anæsthetist, Mayo and Albert Victor Hospitals, Lahore, 1930. Pp. 366. Illustrated. Published by and obtainable from the author. Price, Rs. 5, post free

THIS book deserves encouragement. It is perhaps the first of its kind published in this part of the world. It mentions all the important methods of anæsthesia,

as well as some of the new drugs used. Although concise it deals fairly thoroughly with the different aspects of the subject. It will be of use to those who aspire to specialise in anaesthesia.

S. N. M.

Annual Reports

REPORT OF THE EUROPEAN MENTAL HOSPITAL AT RANCHI FOR THE TRIENNium, 1927—29. By LIEUT.-COL. OWEN A. R. BERKELEY-HILL, M.A., D.M. (OXON.), I.M.S., MEDICAL SUPERINTENDENT. RANCHI: SUPERINTENDENT, GOVERNMENT PRINTING, BIHAR AND ORISSA

The following are abstracts from this report.

During the period under review, this hospital received patients, European and American, including those of mixed blood, from Bengal, Assam, the United Provinces of Agra and Oudh, the Punjab, the Central Provinces, Berar, British Baluchistan and Bihar and Orissa. It

also received patients on transfer from any mental hospital in India provided the government of the provinces in which they were domiciled agreed to bear the cost of their maintenance.

Patients eligible for admission into this hospital are Europeans and Americans, including persons of mixed blood whose habits are those of Europeans, and the term 'Europeans' is held to include persons born in the British Colonies and Dominions and their descendants, being either purely white or of mixed blood subject to the proviso as to European habits.

During the triennium under notice, the number of beds in the hospital (excluding hospital and segregation wards) was increased to 206, i.e., 106 for males and 100 for females.

Voluntary patients.—As before, persons who are aware of their mental condition but whose mental illness is not sufficiently advanced to require certification continued to come to this hospital seeking admission as ordinary patients. They were lodged as boarders in this hospital.

The following table gives the statistics concerning such cases treated in this hospital during the triennium under report as compared with the previous triennium:—

Voluntary patients	TRIENNIAL PERIOD					
	1927—29			1924—26		
	Male	Female	Total	Male	Female	Total
Total number of cases treated.	57	47	104	44	19	63
Left the hospital after a full course of treatment.	39	32	71	28	10	38
Left the hospital before treatment was complete.	6	5	11	..	1	1

The interesting points brought out by the figures in the above table are (i) that there is a progressive upward trend in the admissions of this class of patients and (ii) that by increasing facilities for early treatment of mental disorder without certification, it will be

possible to effect a reduction of the number of cases of insanity of confirmed character.

Total population.—The following table shows the population of this hospital during the triennium under review as compared with the previous triennium:—

—	1927	1928	1929	Mean of 1927—29	1924	1925	1926	Mean of 1924—26
Cases ..	262	280	255	266	204	207	253	221

The mean annual population of this hospital for the triennium under report was 266 against 221 in the preceding triennium, giving an increase of 45. The increase may perhaps be ascribed to a growing tendency among the public to look upon this hospital as an institution where their mentally sick are treated and

where they may recover, rather than a place where they will be simply confined.

Percentage of cases 'cured' to direct admissions.—The subjoined table gives comparative data relating to percentage of cases 'cured' to direct admissions of both sexes during the last two triennia:—

	1927	1928	1929	Mean of 1927—29	1924	1925	1926	Mean of 1924—26
Total population.	262	280	255	265.66	204	207	253	221.33
Compare:								
Direct admissions.	70	88	62	73	55	48	86	63
Ratio per cent. of cases 'cured' to direct admissions.	24.28	22.73	12.90	19.97	15.22	14.05	15.76	15.01

It will be observed from the above table that the mean rate of 'cures' for the triennium under review was 19.97 per cent. of the direct admissions (inclusive of readmissions) against 15.01 of the previous triennium, showing an increase of 4.96 per cent.

After-care of discharged patients.—Enquiries continue to be made concerning discharged patients of this hospital, partly through the after-care associations and partly from ex-patients themselves as well as from their relatives and guardians. The results of these enquiries are recorded on the index card which summarizes each case. It may be noted that out of the total number of patients treated at this hospital during the triennium under report, 175 were discharged of whom 44 have been readmitted and 3 died. The length of time for which the remainder, i.e., 128, have been out of the hospital is shown by the following tabular statements:—

Period	Number of discharged patients of both sexes
Under six months	45
Six months and under 12 months	29
12 months and under 18 months	17
18 months and under 24 months	10
24 months and under 30 months	9
Upwards of 30 months	18
TOTAL	128

without psychosis and two cases (one male and one female) not insane were admitted. They were discharged from the hospital as soon as possible. Six epileptics were also admitted during the same year. In this connection, I should like to emphasise the desirability of establishing a separate hospital for epileptics. If such a hospital is located centrally, it would serve the needs of all provinces like this hospital and it would provide an adequate care and treatment of this class of patients on an organised basis which is not possible in a mental hospital. In the absence of such a hospital, patients suffering from epilepsy continue to be admitted into this hospital and are required to take their places in the wards among patients suffering from mental disorders—an arrangement which is highly undesirable.

Seclusion and restraint.—No form of seclusion or restraint has been adopted throughout the triennium under review, except occasional stoppage of paroles of patients who became wilfully disorderly.

Absconding.—It is gratifying to note that although the majority of patients of both sexes were granted local and Ranchi paroles and more liberty was allowed to them, a very few absconded only for a short time but all of them were eventually brought back to the hospital.

Ages of patients.—The following table shows the ages of patients admitted into this hospital during the last two triennia:—

Ages	1927	1928	1929	Average for 1927—29	Average for 1924—26
Under 20 years	4	6	9	6	7
Between 20 and 40 years	38	44	37	40	38
Between 40 and 60 years	23	32	12	22	16
Upwards of 60 years	5	6	4	5	3
TOTAL	70	88	62	73	64

Out of the 128 patients noted above, 57 are living with friends and relatives but are unable to support themselves, 64 are supporting themselves in some career or other, 2 are known to be pursuing their original vocations, while 5 have been lost sight of.

Forms of mental disorder in patients treated.—The following table gives the principal forms of mental disorder in patients treated in the hospital during the last three years:—

Forms of mental disorder	Number of cases			Mean for 1927—29
	1927	1928	1929	
Circular Insanity.	24	22	21	22
Confusional Insanity.	10	9	3	7
Delusional Insanity.	17	21	17	18
Dementia Præcox.	52	55	54	54
Imbecility.	25	27	25	26
Insanity from other causes.	46	49	39	45
Mania.	12	7	8	9
Melancholia.	5	2	5	4
Secondary or Terminal Dementia.	56	56	53	55
Senile Dementia.	3	6	5	5

It is noteworthy that during 1929, five male and two female patients suffering from psychopathic inferiority

The figures set forth in the above table indicate that the ages between 20 and 40 have supplied the largest number of patients of mental disorder, and the ages between 40 and 60 claim the next in order of frequency.

Treatment of mental conditions.—*General.*—The plan adopted last year of allowing patients to mix more freely with each other by abolishing the segregation of the sexes has not given rise to any untoward incident. This innovation in treatment places the Ranchi European Mental Hospital in a position which is probably unique throughout the world. During my leave, I visited several mental hospitals in England and America, but I did not find anywhere this system of treatment. Indeed, in some of the mental hospitals in America, I was surprised to find there is still a great deal of locking of doors. While several of my colleagues in both England and America agreed with my view that the great defect of mental therapy is the necessity for institutional care, I found none willing to go as far as I have gone in respect to creating an atmosphere of liberty.

Occupational therapy.—This form of therapy still remains here, as elsewhere, the sheet anchor of our treatment. During my tour in England and America I paid particular care to the study of occupational therapy and was very surprised to find in what a rudimentary state is this form of treatment in many hospitals in England. In the famous Maudsley Hospital in London and in one of the best-known county hospitals in England, occupational therapy can hardly be said to exist. On the other hand, in the Bloomingdale Hospital, near New York, occupational therapy has reached a truly wonderful state of development, while in the Manhattan State Hospital I learnt how much admirable work can be done without using anything but waste materials.

In such circumstances, it is a great pleasure to me to be able to report that during 1929 many improvements have been made in the work of the Occupational

Therapy Department. The following new occupations have been introduced:—

Cement and concrete work, Braille, cookery class, mattress making, coir matting, and raffia work.

There has been considerable improvement and expansion in some of the existing sections. Both the cane section and the cobbling section have undergone development and improvement. Ericulture has been introduced into the sericulture section. The plantation of mulberry trees and castor-oil plants has increased to cover an acre of land.

I should like to take this opportunity to express my thanks to both the Occupational Therapists for the way they have worked to develop their Department. To Mr. A. K. Mukherjee, my special thanks are due in that he has never spared himself in the work of organising and administering the Department.

Therapy by induced malaria.—During the year, we continued our investigation of the value of artificial malaria as a therapeutic measure. Altogether seventeen patients, including five epileptics, were treated by this method. Of these, one patient (suffering from catatonic dementia præcox) made a remarkable recovery and was discharged cured. The other cases showed only a transient improvement. The five cases of epilepsy showed no improvement.

SPORTS AND AMUSEMENTS

Music.—The band continued to assist in the recovery of many of our patients. Community singing, route marches and dance socials went on as heretofore. During the hot weather there were *moonlight promenade concerts on Monday evenings*. During the year, a string orchestra was started, including a jazz band. The band master continued to supervise piano lessons and piano practice for those who showed either a talent or an inclination for such.

Games.—Out-door and in-door games were kept up to standard throughout the year. Improvements and additions worth noting are the introduction of mixed hockey and basket ball. Nine cricket, six football and seven hockey matches were played during the year 1929.

Other amusements.—I have to thank Drs. S. K. Chaudhury and M. M. Das for their kindness in staging an Oriya Dance and giving much pleasure thereby. The usual 'At Home' was held on Anniversary Day (18th May) which was attended by a number of guests, European and Indian, from Ranchi. During the hot weather, selected patients indulged in boating and swimming in the lake.

Cinema.—The hospital cinema continued to give regular displays throughout the triennium under review. This has added to the entertainment of the patients and has been of great therapeutic value.

KING EDWARD VII MEMORIAL PASTEUR INSTITUTE, SHILLONG. FOURTEENTH ANNUAL REPORT FOR THE YEAR 1930. PRINTED AT THE ASSAM GOVERNMENT PRESS: SHILLONG, 1931. PRICE, 10d. or 9 annas

This report by the Director—Lieutenant-Colonel J. Morison, I.M.S.—contains a good deal of interesting information about the wholesale issue and use of bacteriophage in Assam.

As Shillong is now a distributing centre for the anti-rabic vaccine, and a treatment centre only for the Khasi hills, the numbers attending the Institute were small—308 in all. Seventeen new treatment centres were opened in the province, and the total number of patients applying for treatment was 1,518. The mortality was exceptionally high—27 deaths out of 1,197 persons treated, or 2.26 per cent. This is partly due to two dogs, one at Imphal which bit 6 persons out of whom 4 died, and one at Shillong which bit 4 persons out of whom 2 died. No less than 62 per cent. of the cases treated were classified as severely bitten. Three patients who were very severely bitten received the vaccine intravenously in doses of 2 c.cm. on alternate days, in addition to the ordinary treatment. In

all 30 such persons, believed to be at the gravest degree of risk, have received this treatment, with only one death.

As usual, large amounts of cholera, T. A. B., and anti-influenza vaccines were distributed throughout the province.

Turning to the section of the report dealing with bacteriophage, we may here abstract the following information.

Bacteriophage.—One lakh twelve thousand two hundred and thirteen doses of combined cholera-dysentery bacteriophage were issued during the year, making a total of 279,014 since the preparation of bacteriophage was begun at this Institute three years ago.

In spite of the wide and extending use of bacteriophage in Assam few medical officers return the case sheets enclosed with every box. It is not realised that though in Assam the bacteriophage has established itself through experiences not often possible in other places, others without such facilities await controlled figures capable of statistical examination. Notes are to hand of 74 cases treated—six cases of cholera with one death and 68 of dysentery with 2 deaths. The cases actually treated in the province, with a demand such as we have had, must number several thousands.

On the other hand, numerous appreciative letters come to the Institute of which no statistical use can be made.

Of more importance is the experiment in Nowgong district to which a brief allusion was made in last year's report.

It will be recollected that in the report for 1929 an account was given of an epidemic of cholera at Jakrem. The epidemic lasted 18 days. One hundred and forty-three persons fell ill. During the first eight days there were 71 cases with 51 deaths. On the 9th day bacteriophage reached the village and was distributed to as many cases as possible. Between the 9th and 18th days there were 72 cases. Thirteen of these did not get bacteriophage, of whom only one survived. Fifty-nine received bacteriophage and fifty-two recovered. The change that came over the mortality on the day after the introduction of the bacteriophage suggested that, could first cases in a village be treated even before a medical man arrived, some effect might be obtained before the epidemic got out of hand. Cholera in Assam exacts its heaviest toll along the banks of certain rivers which are spillways, or old river beds. With the first rains or the rise of the main river the mud flats, used as latrines or for raising a winter crop by the villagers, are flooded and infection spreads along the spillways: in the autumn, when the spillways as rapidly fall and drain the villages on their high banks, the spread of infection again occurs. This affords an explanation of the double seasonal incidence of cholera and dysentery.

Two such areas were selected for observation. The Kallang river in Nowgong and the Barak river as it flows through South Sylhet. These are both spillways, the first of the Brahmaputra and the second of the Kushiara. They are two of the most dangerous areas in Assam. In both cholera is liable to break out in epidemic form biennially with the first rise and again with the fall of these spillways. In South Sylhet the usual methods of dealing with cholera by vaccination, cholera mixture and propaganda were carried out. In Nowgong bacteriophage was distributed to the headmen of villages with instructions to use it for every case of diarrhoea, dysentery or suspected cholera. An inspecting officer from the Institute went at each epidemic season to see that the headmen understood what they were to do.

So far Nowgong has passed through successive epidemic seasons and at the time of writing has not had a single death from cholera for ten months. This has not happened during the previous ten years. Habiganj has been visited by cholera each season. Nowgong has a population of 560,683 most of whom are settled along the banks of the Kallang. Habiganj has a population of 631,214. The experiment will need

to be watched for several seasons more before it can be deemed conclusive, but as epidemic cholera is mainly along these spillways and certain rivers which run almost dry in the dry season it may be economical of life and money to deal in a similar way with the villagers along their banks.

Fundamental research on bacteriophage has made considerable steps forward at this Institute during the last year. For this we are indebted to patient assiduous work by Dr. A. C. Vardon, Dr. B. K. Pal Chaudhury and Dr. Moitra. The analysis of a cholera bacteriophage whereby each of the three types of cholera bacteriophage (Asheshov's A, B and C) present in a mixture can be enumerated by means of dual resistant cultures has been brought to a satisfactory degree of perfection and we are now able to watch the effects of varying conditions on the growth of each type. Not a month and hardly a week passes without an advance in this direction. A much better control of the quality of the bacteriophage is now possible but what has surprised us is that with all our efforts at improvement we were producing two years ago a 'phage which even after two years' storage in the plains has been returned to us hardly to be distinguished from the best we are turning out now. The keeping qualities of the bacteriophage as made by d'Herelle's method in which the types are not separated are very good.

In the dysentery bacteriophage we have determined six different types which we have called G, H, J, K, L and M. The first five types were all obtained in Assam. The last was recently obtained from a bacteriophage prepared at Le Laboratoire Du Bacteriophage, Paris, which in turn lacked two of our types. The analysis of a dysentery 'phage is now carried out by means of six Flexner strains of dysentery which have been made resistant to the six types of 'phage taken five at a time. With the co-operation of Dr. Weldon, Chief Medical Officer, Assam-Bengal Railway, and Dr. G. Fraser of Labac, an interesting series of observations is being made on the types present in cases of dysentery, some cases have only one type, it may be apparently any one of the first 5 types, other cases have 2, 3, 4 or 5 types present and it is possible that rapid recovery from dysentery depends not on the mere presence of bacteriophage but on the presence of an adequate number of types.

The research on cholera vibrios was continued with the assistance of Dr. Moitra and Major S. R. Prall, I.M.S.

The past year has seen important steps towards an extension of the activities of the Pasteur Institute in the field. To this end and to permit the great industries of Assam to share in these activities, the Assam Medical Research Society has been formed. Appended to this report is a copy of the Government Communiqué inaugurating the society, the Memorandum of Association of the society and a list of the honorary officers, the governing body and the Scientific Advisory Board. The society is supported by membership and voluntary subscriptions. For the first year Rs. 20,000 has been voted by the Assam Legislative Council, a sum not exceeding Rs. 15,000. The Tea Association proportionate to that of other industries in Assam, Rs. 15,000. Research Fund Association and £100 sterling by the Assam Oil Company. Of this, Rs. 50,000 has been allocated to Malarial Research and Dr. John de la Mare Savage has been selected as the Research Officer.

REPORTS OF THE ROTUNDA HOSPITAL FOR THE YEAR 1929-30. BY DR. BETHEL SOLOMONS, M.D., F.R.C.P.I., M.R.I.A. PARK-GATE PRINTING WORKS: DUBLIN

DR. SOLOMONS' annual reports on the famous Rotunda Hospital of Dublin are always interesting reading, and contain valuable teaching with regard to obstetrics.

The outstanding event of the year was the opening of a new wing, an extension of the gynaecological department. This contains an operation suite, consisting of a theatre, sterilising room, wash up and anaesthetic

rooms, and an office with bathroom. For students and post-graduates there are two movable galleries entered by a staircase apart from the theatre: by this system students can obtain a clear view of the operation without being actually in the theatre itself.

During the year under review there were 2,258 deliveries in the hospital, and 1,724 in the extern department. There were no deaths in the extern department (but this is partly due to the fact that all dangerous cases and those which require special care and attention are admitted to hospital).

Of 41 infants which died in hospital, 36 died within 8 days or less of birth. Three babies died of melæna neonatorum despite all treatment; in cases where hæmorrhage occurs from the stump of the cord, underpinning it is the only method of saving life.

Lactic acid milk has been found a most satisfactory method of infant feeding in the nursery department. Apart from eclampsia and eclampsism no less than 629 other patients admitted showed albuminuria; in fact albuminuria is so constant a feature of late pregnancy that Dr. Solomons wonders if it is not normal. There were 37 cases of eclampsism, of whom 3 mothers died. One fatal case showed blindness as the predominant symptom. Cerebral hæmorrhage is the usual cause of death in true eclampsia, and mental symptoms are not uncommon.

There were 41 cases of accidental hæmorrhage: here puncture of the membranes and administration of pituitrin are the chief lines of treatment. Prophylactic saline is given to all, and stimulants pressed. In one instance the hæmorrhage occurred from placental separation from the site of a previous Cæsarean section. Nineteen cases of placenta prævia were treated without any maternal mortality; bipolar version and Cæsarean section were the chief lines of treatment.

One hundred and ten cases could be classed as disproportion. 'Disproportion is the abnormality in obstetrics which really requires experience', writes Dr. Solomons. 'After six months in a maternity hospital a post-graduate is beginning to acquire some knowledge of this subject through his increased knowledge of normal labour'. Thirty of these patients delivered themselves spontaneously. On the other hand, of 23 cases of uterine inertia only one was spontaneously delivered, and in 20 forceps had to be used.

Cæsarean sections numbered 43; 18 of them being repeat cases. Disproportion was the chief indication for the operation, with placenta prævia second. In one instance the operation was carried out on account of chronic toxæmia with very high blood pressure; in another on account of ovarian tumour incompatible with the continuance of pregnancy.

Forceps were applied 137 times—an incidence of 6 per cent. One hundred and nine of the patients were primigravidae. Fœtal distress is often an indication, and close watching of the fœtal heart is most essential; nurses should be trained in auscultation. Induction of labour was resorted to in 111 cases—oil and quinine 38 times, bougies in 34, puncture of the membranes in 30; there was no maternal mortality.

The morbidity rate, according to the B. M. A. standard, was 5.27 per cent. The rate is 7.3 per cent. for primiparæ as against 3.7 per cent. for multiparæ. Total mortality in all cases attended to—intern and extern—was 0.55 per cent. None of these patients had pre-natal care. As the result of three deaths during his Mastership, Dr. Solomons has now given up the use of chloroform in the labour ward at the Rotunda—ether being used instead.

In the Gynaecological Department there were 801 admissions, and 66 hysterectomies. The total operation is the choice when the cervix is involved in erosion or ectropion, or if there is any leucorrhœa. The ovaries are left *in situ* if normal, but many cases are complicated by adhesions, degenerations and ovarian tumours. At the moment radium seems to be achieving the best results in carcinoma of the cervix, but it is curious to note the steady falling off in admissions for this condition; better midwifery and the practice of partial

amputation for erosion of the cervix appear to be responsible.

An unusual case was one where ovarian transplantation was carried out in a patient with amenorrhœa; the graft took and menstruation returned. Cases are not uncommon where a pessary has to be dug out of the vagina after being there for months or years. One fatal case of true pulmonary embolism occurred.

The Pathologist—Dr. F. S. Bourke—in his report records that throat cultures were taken from the nursing, post-graduate and student staff of the hospital—special attention being given to the theatre staff. A few showed hæmolytic staphylococci, but in no instance were hæmolytic streptococci isolated—a very satisfactory result.

FEDERATED MALAY STATES. ANNUAL REPORT OF THE INSTITUTE FOR MEDICAL RESEARCH FOR THE YEAR 1930. KUALA LUMPUR: F. M. S. GOVERNMENT PRINTING OFFICE, 1931

This report, by Dr. A. Neave Kingsbury, the Director, again tells of the most valuable research work in tropical diseases carried out year by year by the Kuala Lumpur Institute. Of its 91 pages, 52 are devoted to research work, and the remainder only to the enormous volume of routine work carried out. In his introduction, indeed, Dr. Kingsbury complains of the extent to which the tremendous growth of routine work is interfering with research. This problem is one which every medical research institute in India has to face, and its solution does not appear to become any easier. It is difficult to get the lay administrator to understand that men with a capacity for original research work are wasted when their time is loaded up with routine work that could be as readily carried out by others.

The main bulk of the report analyses and reviews the work of the Institute on tropical typhus, originated by Dr. Fletcher and now continued by Dr. L. Anigstein. Two different antigenic strains appear in *B. proteus* X 19 as isolated in Malaya; the Kingsbury (K) strain, and the Warsaw (W) strain. Sera from the large majority of cases occurring in towns agglutinate with the latter strain, and the urban type of tropical typhus appears to correspond serologically with European typhus. More than 400 guinea-pigs were inoculated with the virus, but only 11 per cent. reacted with fever. Tropical typhus in fact is nothing like as pathogenic to the guinea-pig as is typhus exanthematicus, and in the former infection the type of fever in the guinea-pig resembles that produced by infection with Brill's disease. Some 6 per cent. of inoculated guinea-pigs show hæmorrhagic lesions in the testes and tunica vaginalis, and from these micro-organisms resembling Rickettsiæ have been isolated.

Of 43 rats inoculated with virus from human patients, 12 gave positive Weil-Felix reactions at titres of from 1 : 125 to 1 : 250. In a later series of rabbits and rats inoculated, up to 35 per cent. gave a positive reaction. One rat which showed no fever gave an agglutination to a titre of 1 : 1,000 with the K antigen, showed loss of weight, and at autopsy a typical testicular reaction. In two instances, the sera of rats inoculated with K virus agglutinated the W strain, thus showing that a change over in type may occur. Hæmorrhagic foci are common in the lungs of infected guinea-pigs and histological lesions in the brain similar to those in typhus exanthematicus. The whole trend of the experimental evidence goes to show that in the tropics serological variation in the virus of typhus fever may occur as the result of the passage of the virus through some other animal.

This at once raises the question of reservoirs of the infection, other than man, occurring in the tropics, with special reference to rodents. Of 200 rats captured and examined, 4.5 per cent. showed testicular lesions similar to those in inoculated animals, and positive Weil-Felix reactions were obtained with the sera of 11 per cent. of

130 rats examined on an estate where the disease occurred. Five strains of a *B. proteus* serologically related to X 19 were cultivated from the rats examined, and it now appears highly probable that tropical typhus occurs as a natural infection among the rats in Malaya.

In studying the disease bacteriologically, defibrinated blood is taken from patients, as early as possible in the course of the disease, and inoculated into Hottinger broth (the formula for which is given in the Report) containing glucose and ascitic fluid. Seventy-six strains were isolated in culture, including 23 from patients' blood and 6 from patients' urine. The organisms are all Gram negative, very pleomorphic in morphology, and resemble Rickettsiæ. The strains isolated fall into three main biochemical groups according to their sugar reactions. One strain, isolated from an inoculated rabbit, when first isolated failed to ferment any sugar and was classified as Group I; later, however, it acquired the property of fermenting certain sugars and became intermediate in position between groups II and III. A similar phenomenon has been shown to occur with European typhus exanthematicus.

The pathogenic properties of the cultures appear to be as variable as their morphology and biological characteristics. The fusiform type isolated from patients' blood was usually of low virulence to guinea-pigs; the diphtheroid type—derived from animals inoculated with patients' blood—caused marked loss in weight and testicular reaction in guinea-pigs; whilst the minute, coccæ, Rickettsiæ type was highly virulent to guinea-pigs, rats and rabbits. The fusiform type of culture was found non-virulent to man on intravenous inoculation, whereas a volunteer inoculated with the minute cocco-bacillary type gave a positive Weil-Felix reaction four weeks later.

Tropical typhus is endemic on an oil-palm plantation near Kuala Lumpur. In a population of about 700 persons the incidence has been

46	cases in 1927
46	" " 1928
68	" " 1929
59	" " 1930

Two additional endemic centres were discovered in 1930—both of them plantations. Upwards of 70,000 rats were destroyed in 1930 on the oil-palm plantation in question, yet this scarcely affected the incidence of the disease. The insect vector is probably a mite, and sulphur preparations, tobacco juice and crude nicotine sulphate may be of value as insecticides. The most hopeful measure of prophylaxis and control, however, would seem to be the preparation and use of a vaccine.

Dr. Anigstein accordingly directed his attention to this possibility. Two strains of virus were obtained from experimentally infected rats which had given a strongly positive Weil-Felix reaction, and a third strain from a rat inoculated with the blood of a tropical typhus patient. Morphologically, all three strains were Gram-negative slender bacilli with occasional thread-like forms. Forty-eight hour cultures from agar slopes were emulsified in 0.3 per cent. formalin saline, and tested after 24 hours for sterility. Strengths of 200 million and 400 million organisms per c.cm. were put up. Between June 30th and August 2nd

300	labourers received 2 inoculations each.
70	" " " 1 inoculation "
300	served as non-inoculated controls.

During the period September to December 13 cases occurred: of these 1 patient had received two doses of vaccine; 2 had each received one dose; 9 were non-vaccinated controls; whilst in the thirteenth it was not known if he had been vaccinated or not. These results are distinctly encouraging.

Turning to the possible insect vectors, results obtained by feeding body lice (*P. corporis*) on cases of tropical typhus were irregular. A rat inoculated with a crushed emulsion of such fed lice gave a positive Weil-Felix reaction at 1 : 125, and a culture, isolated

from this rat, was agglutinated by X 19 immune serum to a titre of 1 : 800. Inoculation of the small coccid type of organisms into lice was followed by an intense infection and the appearance of Rickettsia bodies in smears. *P. capitis* is not uncommonly found in Malaya on Indians of the labouring class, but in view of the very limited migratory habits of these insects, they probably very rarely, if ever, function as carriers. Examination of labourers returning from work in the endemic area again showed a prevalence of *Trombicula akumushi* (the kedani mite) on them, and examination of trapped jungle animals showed that *T. deliensis* is widely distributed in the locality on squirrels, rats, 'musang' and 'plandok'. Mites of this genus are almost certainly the chief vectors.

A great deal of interesting work was carried out in the Malaria Research Department by Dr. R. Green and Dr. C. R. Amies. An extensive experiment was carried out on the value of plasmoguinine in the field control of malaria. Three neighbouring estates with populations respectively of 330, 360 and 400 were taken: in February 1930 spleen rates, parasite rates, haemoglobin index, etc., were observed and recorded for all persons on each estate. All persons on the first estate were now put on to plasmoguinine—0.04 gramme for an adult every Monday and Thursday. Children received the appropriate dose in an emulsion from graduated pipettes. The other two estates served as untreated controls. Spleen and parasite rates, etc., were again observed in May at the end of 3 months, in August at the end of 6 months, and in November, at the end of 9 months.

Unfortunately the experiment was severely handicapped by the conditions prevailing in the rubber world.

During the ten months, the population on the experimental estate had dropped from 330 to 172: of the latter no less than 69 were new arrivals, and only 103 original residents. In addition there was the possibility of coolies getting infected when visiting distant bazaars or other estates, and of gametocyte carriers coming into the experimental estate as visitors.

Among the original population on the experimental estate the parasite rate (thick films) fell from 27.2 to 17.4 per cent. and the *P. falciparum* gametocyte rate from 10.6 to 0.0 per cent. On the two control estates the parasite rates fell from 23.8 to 22.9 and from 17.2 to 13.7 per cent. Here regular oiling was carried out, whereas in the experimental estate oiling is difficult on account of the characters of the ground. The results of the experiment were not as good as had been hoped for, but they are sufficiently encouraging to show what might be accomplished under better controlled conditions.

Batches of *A. maculatus* and *A. philippinensis* were fed on crescent carriers before and after the administration of plasmoguinine. Eleven gametocyte carriers were used, and 2,040 mosquitoes applied, and dissected 15 days later. Results showed that crescent carriers become non-infective to mosquitoes after a total dose of 0.4 gramme of plasmoguinine, and remain non-infective for a period of at least 3 days.

It was found that treatment of crescent carriers with 20 grains of quinine plus 0.04 gm. of plasmoguinine daily freed 76 per cent. of all crescents by the 7th day of treatment, and 96 per cent. by the 10th day. Among the controls, to whom quinine only was given, 60 per cent. retained their gametocytes.

Further, numerical observations on patients on (a) quinine only, and (b) a diaphoretic mixture only showed that crescent production occurred equally vigorously on both; the administration of quinine therefore does not inhibit crescent production.

Quinine-stovarsol was tried out in 12 cases of benign tertian, 12 of quartan, and 10 of sub-tertian malaria, in doses of 12 grains daily for 14 days or longer. It took from 3½ days for benign tertian to 7 days for malignant tertian to clear the blood of parasite forms, whilst crescents were detected after four weeks continuous treatment with the drug in one case. Fever was not controlled rapidly, and in some instances the

administration of the drug appeared to cause exacerbation of the febrile symptoms. The drug appeared to have no effect on the production, viability, or number of crescents. Parasite counts indicated that infections were not more rapidly brought under control with quinine-stovarsol than with quinine alone. In brief, quinine-stovarsol does not appear to have any advantages over quinine alone.

A very interesting section of the Report deals with monkey malaria. On examining the blood of monkeys at the Institute, Dr. McSwan found a *Plasmodium* in *Macacus cynomolgus* with resemblances to *P. vivax* of man, *P. kochi* of *Cercopithecus* monkeys, and *P. inui* of *Macacus* monkeys. Three out of nine monkeys examined were found infected; the infection is readily transmissible by blood inoculation, and the disease runs a mild course in inoculated monkeys. Attempts to transmit with *Culex* and *Aedes* mosquitoes had negative results; but oöcysts and sporozoites resulted in *Anopheles maculatus* and *A. kochi*, and oöcysts in *A. vagus*. As many as 26 large oöcysts were found in one specimen of *A. kochi* nine days after feeding on a monkey with 220 gametocytes per c.mm. of blood. The oöcysts are indistinguishable from those of *P. vivax*. Sporozoites appeared in the salivary glands from the 16th day onwards.

One lesson which Dr. Green derives from his studies in monkey malaria is that in any area where there are many monkeys infected, oöcyst and sporozoite rates in the local anophelines may not indicate the true index of human malaria in the district.

Several mosquito surveys were carried out during the year, and all confirmed the importance of *A. maculatus* in Malaya. In an experiment on colour tropism in mosquitoes it was found that, both in darkness and in daylight, adult imagoes tend to avoid yellow cloth, and to make for both white and black. The addition of iron pyrites to slowly running water in springs and seepages was found to reduce markedly the amount of anopheline breeding.

Two cases of Japanese river fever came under observation during the year, both in young European planters. In the first the Weil-Felix reaction became positive at a titre of 1 : 1,000 from the 14th to the 19th day of illness; in the second the reaction was positive throughout to the K strain at titres of from 1 : 125 to 1 : 500.

The studies on the anaemia of pregnancy, mentioned in previous reports, were continued. Among 58 cases studied not one showed macrocytic anaemia, and the anaemia appeared to be secondary rather than primary and idiopathic. Non-pregnant normal Tamil women gave a haemoglobin (Tallqvist) reading of only 73 per cent. Malaria, helminthic infections, tuberculosis and syphilis may all be contributory factors, whilst further research may indicate some nutritional defect.

The liquid extract of rice polishings previously issued by the Institute was replaced during the year by a solid tablet extract. Thirty-seven cases of beriberi were treated with this, with 23 other cases as controls treated by marmite. Results indicate that the extract will probably be of more value as a prophylactic than in treatment. For children a highly concentrated syrup is used in a daily dose of 10 to 20 minims.

Studies were continued on the different reactions of enteric fever sera to 'H' and 'O' antigens in the Widal test. The latter is of much more diagnostic importance. Typing of local strains of pneumococci was continued throughout the year, and the comparatively low percentages of Types I, II and III are noteworthy.

Bacteriological studies of local waters were continued. About 30 per cent. of the lactose-fermenting strains in Kuala Lumpur waters may be regarded as of intestinal origin.

The issue of vaccine lymph from the Institute was commenced in March 1930, and the outbreak of a smallpox epidemic in August–October made heavy demands on the new lymph station. It was decided to issue no lymph which was potent at dilutions higher than 1 : 4,000 when tested by the intra-dermal test

on rabbits. In order to comply with this standard, considerable dilution was necessary with certain batches, and there were indications that such diluted lymph failed to maintain potency when exposed to room temperature, and deteriorated more rapidly than batches diluted to a less degree. In the hope of obtaining greater yields of vaccine pulp two inoculated buffaloes were seraped at 116 and 120 hours respectively after vaccination, instead of at the usual interval of 96 hours. The yield was considerably greater, but the potency, as tested by intra-dermal tests on rabbits, was definitely reduced. Encouraging results were obtained with lymph diluted 1 in 20 to 1 in 30 with normal saline just before use.

Prophylactic inoculation of dogs against rabies was commenced in Malaya in 1925, the vaccine used being a 20 per cent. emulsion of fixed virus buffalo calf brain. In Kuala Lumpur vaccination of dogs is compulsory before dog licences are issued. In three years the results of mass inoculation of dogs have been as follows:—

	1928	1929	1930
Number of rabid dogs	29	29	0
Number of dogs inoculated	755	425	3,200

Out of a total of more than 5,000 dogs inoculated only 3 cases of rabies have been reported and in all of these it is likely that the dog was bitten before it was inoculated. On the other hand, complications are not uncommon; 5 to 10 per cent. of the dogs developed abscesses at the site of inoculation, a reactionary fever without local sepsis is not uncommon, and in 10 dogs paralysis of the hind limbs was reported—probably of neuro-paralytic origin.

Turning to the routine work, cholera, plague, T. A. B. C. and anthrax vaccines were issued; 253 out of 1,961 throat swabs examined yielded diphtheria bacilli; a very large number of bacteriological examinations was called for in connection with enteric fevers, including 2,696 Widal tests. The Weil-Felix reaction was tested on 2,869 sera from 2,413 persons. Water samples bacteriologically examined numbered 1,107, whilst 160 patients were treated with anti-rabies vaccine with no deaths. Four fatal cases of hydrophobia occurred in non-vaccinated persons. In the pathology department 388 specimens were received for histological diagnosis, and included 117 of malignant tumours. Autopsies were carried out on 483 unclaimed bodies. The lymph station issued 107,621 capillary tubes during the last ten months of the year. Wassermann and Kahn reactions numbered 17,277, having risen to this total from a figure of 6,900 in 1925. In the chemistry division much work was done on water and milk supplies, many biochemical examinations were called for, 132 specimens were examined in connection with cases of suspected poisoning, and 233 blood stains were tested in connection with medico-legal cases.

Dr. Neave Kingsbury and his staff are to be congratulated on a most interesting report on a year of most valuable investigations.

Correspondence

PRE-NATAL DENTITION

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—The following case may be of interest to some of your readers.

I was recently attending a confinement case in which a male child was born. I found that the child was born with two well-developed lower incisor teeth. I examined both the teeth and found that they were well developed, fixed, and quite like the teeth of a child

of a year of age. The child was alive and healthy. The incident is, I think, an unusual one.—Yours, etc.,

S. N. CHATTERJEE, L.D.S.,
Palganj Charitable Dispensary,
Hazaribagh District.

20th November, 1931.

Service Notes

APPOINTMENTS AND TRANSFERS

THE services of Brevet-Colonel H. H. Thorburn, C.I.E., have been replaced at the disposal of the Foreign and Political Department, with effect from the date of the termination of his leave.

Lieutenant-Colonel R. Knowles, on return from leave ex-India, is re-appointed as Professor of Protozoology, School of Tropical Medicine and Hygiene, Calcutta.

Lieutenant-Colonel C. A. F. Hingston, C.I.E., O.B.E., has been appointed as Honorary Surgeon to H. E. the Viceroy, *vice* Colonel J. Fuller-Good, retired.

Lieutenant-Colonel L. Cook, C.I.E., has been appointed as Inspector-General of Civil Hospitals, Bihar and Orissa, with effect from the 10th August, 1931.

Lieutenant-Colonel R. G. G. Croly has been appointed to officiate as Surgeon-General with the Government of Madras, with effect from the 9th October, 1931.

Lieutenant-Colonel W. J. Simpson has on return from leave been posted as Agency Surgeon in Bhopal, with effect from the 17th October, 1931.

Major H. J. H. Symons, M.C., on return from leave, resumed charge of the Office of the Residency Surgeon, Bushire, with effect from the 21st October, 1931.

Major P. C. Banerji, on return from leave, is appointed as Civil Surgeon, Bakarganj, *vice* Major H. E. Murray.

Major H. K. Rowntree, M.C., Civil Surgeon, Simla (East), will hold charge of the duties of Civil Surgeon, Simla (West), in addition to his own, *vice* Lieutenant-Colonel V. N. Whitamore.

Major H. E. Murray, on the expiry of leave granted to him, is appointed as Civil Surgeon, Midnapore.

The services of Major J. Chandra have been placed at the disposal of the Government of Bihar and Orissa for employment in the Jail Department, with effect from the 30th October, 1931.

The services of Captain R. N. Bhandari have been placed permanently at the disposal of the Government of the United Provinces, with effect from the 5th January, 1929, for employment in the Jail Department.

Lieutenant M. Jafar has been appointed as Captain (provl.) (on probation), with effect from the 9th October, 1931.

The officers named below have been confirmed on passing the necessary courses of instruction:—

Captain M. H. Wace.
Captain (provl.) A. K. M. Khan.
Lieutenant F. H. A. L. Davidson.
Lieutenant R. T. Hicks.
Lieutenant D. J. Young.
Lieutenant R. C. Dracup.
Lieutenant D. McCarthy.
Lieutenant P. L. O'Neill.

LEAVE

Major-General C. A. Sprawson, C.I.E., V.H.S., Surgeon-General with the Government of Madras, has been granted leave out of India for 4 months from the 9th October, 1931.

Lieutenant-Colonel J. B. Hanafin, C.I.E., Assistant Director-General, Indian Medical Service (Sanitary), has been granted leave on average pay for 1 month and 2 days, with effect from the 19th November, 1931, and his services have been replaced at the disposal of the Army Department, with effect from the date of the expiry of his leave.

Lieutenant-Colonel V. N. Whitamore, O.B.E., Civil Surgeon, Simla (West), has been granted leave on

average pay for 4 months, with effect from the end of November 1931.

Lieutenant-Colonel C. M. Plumptre, Officiating Civil Surgeon, Karachi, is granted leave on average pay for 4 months, with effect from the 27th November, 1931, or the date of availing.

Major L. K. Ledger has been granted leave for 12 months, with effect from the 9th October, 1931.

Major H. E. Murray, Civil Surgeon, Bakarganj, is granted leave for 1 month, with effect from the 1st January, 1932, or from the date of relief.

PROMOTIONS

The undermentioned officers have been granted seniority in the rank of Colonel from the dates noted against their names:—

H. M. Mackenzie, V.H.S., 27th July, 1923.

S. R. Godkin, D.S.O., 28th December, 1923.

C. W. F. Melville, K.H.P., 29th July, 1924.

H. R. Nutt, 27th December, 1924.

J. Husband, 27th December, 1924.

G. C. L. Kerans, D.S.O., 27th December, 1924.

L. P. Brassey, 27th December, 1924.

P. L. O'Neill, C.I.E., 27th December, 1924.

W. R. J. Scroggie, C.I.E., 29th July, 1925.

E. A. Walker, V.H.S., 26th January, 1926.

F. E. Wilson, 26th January, 1926.

J. P. Cameron, C.I.E., 26th January, 1926.

The promotion of Major K. R. Rao to the rank of Major has been antedated to the 31st July, 1925.

The officers named below have been promoted from Captain to Major, with effect from the dates noted against their names:—

R. W. H. Miller, 9th October, 1931.

P. A. C. Davenport, 22nd October, 1931.

R. T. Advani, 14th November, 1931.

W. C. McKee, 18th November, 1931.

Lieutenant M. R. Sinclair has been promoted to the rank of Captain (prov.) from the 1st August, 1931.

RETIREMENTS

Lieutenant-Colonel J. L. Lunham has retired from the service, with effect from the 7th September, 1931.

Lieutenant-Colonel J. V. MacDonald, M.C., has retired from the service, with effect from the 9th July, 1931.

Notes

'HEALTH IN THE MAKING' CINEMA FILMS

THE ever-lurking menace of tuberculosis was emphasised by one of the finest educational films yet exhibited in Calcutta entitled 'Food for Thought', which was recently shown at the Empire Theatre. This is the first of a series of films to be released by the New Health Society of London under the heading of 'Health in the Making'.

Sir Arbuthnot Lane, the President, in a short prologue explained the aims and objects of the Society, which are to instruct the masses regarding the dangers that threaten them in their every-day lives and to educate them in the choice of the purest foods.

The health departments of the Calcutta Corporation and of other large cities in India have for some years past exercised a certain amount of control over the milk supply, and to a great extent they have succeeded in providing pure milk at municipal stalls, but the purest of cow's milk often harbours tuberculosis germs and foreign matter which is only perceptible under the microscope.

For some years food scientists have been devising means whereby these health-destroying properties even in the purest milk can be eradicated, the results of their efforts being the production of scientifically-prepared dry milk foods, during the process of manufacture of which tuberculosis germs are destroyed and all impure matter extracted.

The highly hygienic and scientific methods adopted by the 'Cow and Gate' Milk Food Company are impressively depicted in the film under review. The daily yield of 20,000 gallons of milk from cows which are mechanically milked arrives each day at their factory; the contents of each container are immediately tested to ensure their freedom from adulteration; samples are taken for laboratory examination, after which the supply is run through the finest mesh strainers to expel foreign substances, to be received by churns which scientifically extract the tuberculosis germs and indigestible properties in the milk. This residue which constitutes the health-destroying properties of milk comes apart as a pulpy mass.

Free now from every impurity, the milk flows into large vats where it is frozen; the product is then pressed through rollers, comes out in powder form, and is finally packed in hermetically-sealed tins. The 'Cow and Gate' Milk Food is milk in its purest form, a food to be strongly recommended for infants and children.

THE DISPERT PREPARATIONS

PHARMACOLOGY has from very early times striven to produce a form of drug preparation which shall contain the therapeutically active substances of plants or animal organs by means in which chemical or thermic influences shall not harm or even disturb the frequently very susceptible active substances.

All the methods hitherto employed for this purpose have only in part fulfilled their function. Valuable components of the drug were often lost in the process of isolation, and the isolated or synthetic substances sometimes produced an action at variance with the natural product. Thus the aim of utilizing the therapeutic powers of a drug or organ to its best extent remained unaccomplished.

The preparation that has ever been the ideal is described by Walter Zimmermann as: 'A drug with a maximal stability and a minimal volume, capable of an exact dosage of the active substances constituting the *Ens-activum* of the remedy and of preparing them for the physicians' use just as they are combined in the fresh organs or in the drugs.'

The Krause desiccation process was in the first instance employed for the production of a dried milk which excelled all others because the total vitamin content is retained in an unchanged and unimpaired condition.

The Krause process is founded on the simple fact that very finely nebulized particles are more rapidly and easily dried than larger ones. The liquid extract of the substance to be prepared is by means of a special contrivance so finely nebulized that one litre of an extract thus sprayed into the warm air produces a surface of 300 square metres. The initial velocity of the sprayed particles is 140 metres per second, and as the particles sink to the bottom in the form of a dry powder after a 1½ metre trajectory, the desiccation is effected in the fraction of a second—before there is sufficient time for chemical or thermic influences to have any effect.

The constituents of the drugs or organs, the alkaloids, glucosides, albumen combinations, enzymes, etc., which mostly represent the active principles, are seriously impaired by high temperatures and in solution are unstable, whereas the products prepared by the Krause process are dried without any kind of interference with therapeutic efficiency or stability, as has been demonstrated by extensive scientific research, corroborated by practical clinical experiences.

When the process of producing the Krause preparations (Dispers) is considered, it must be quite obvious that they mark a very great advance in pharmacology and medicine. The Dispers is by no means merely a proprietary drug but a preparation which, thanks to its very special mode of production, can rightfully claim the certain special advantages.

In conclusion: By the Krause desiccation process is understood a method whereby extracts, containing in

the solvent the absolutely intact active principles, are obtained from fresh or dry vegetable or animal products and these extracts are liberated from their solvents without the application of temperatures which would bring about a change in the structure of the active principles.

The Dispert preparations are manufactured by Krause Medico-Gesellschaft M.B.H., Munich, Germany, and the sole concessionaires for the United Kingdom and Dominions are Coates and Cooper, 41, Great Tower Street, London, E.C. 3.

THE VALUE OF VITAMINS A AND D IN TUBERCULOSIS.

The following note has been sent to us by the McCoy Laboratories:—

Vitamins A and D and fattening foods are important constituents of the diet for tuberculosis patients. Dr. Burgess Gordon and Dr. En Shui Tai of Philadelphia reported to the National Tuberculosis Association here that a dietetic plan consisting of from 2,500 to 3,500 calories and supplemented with vitamins A and D provides a desirable food intake.

These Philadelphia scientists studied the food eaten by a large group of tuberculous patients and other patients with lung disorders. They found that vitamin A probably helps to prevent the tuberculous patient from developing other infectious diseases. A combination of vitamins A and D apparently favours the increase of body weight.

This serves to confirm the accepted practice of doctors throughout the world prescribing cod-liver oil to tuberculous patients.

With the recent discovery of the extraction of the A and D vitamins in cod-liver oil, McCoy's Laboratories have offered to the world a concentrated form of these A and D vitamins in tablet form, so that now these important vitamins can be had by all tuberculous patients in the summer, as well as in the winter.

The well-known house of McCoy's Laboratories have been the pioneers in the perfection of cod-liver oil tablets, which have helped millions of persons all over the world in putting on firm, solid flesh.

SHADO-CREAM B. D. H.

FOR USE IN X-RAY DIAGNOSIS.

SHADO-CREAM B. D. H. is a pleasantly-flavoured liquid suspension of a specially pure quality of barium sulphate manufactured by The British Drug Houses, Ltd., for use in x-ray examination of the alimentary tract. It contains 50 per cent. of barium sulphate.

When administered orally, barium sulphate possesses the power of increasing the contrast between diseased and normal tissue, and this property renders it invaluable for the x-ray diagnosis of many diseases of the alimentary tract. The heavy nature of barium sulphate, however, is liable to militate against its usefulness, inasmuch as, when it is used in the powder form for making a suspension extemporaneously, there is the possibility that it will not remain in suspension in an aqueous fluid for a sufficiently long period, and that a portion of it may be left by the patient as a sediment at the bottom of the vessel from which it is administered; similar conditions may obtain after it has been swallowed, with the result that the value of the x-ray photograph may be decreased. Attempts have been made to overcome this difficulty by mixing the barium sulphate with starchy substances before administration; but the preparation of such meals involves the use of heat, and the resulting mixture is often distasteful to the patient.

Shado-Cream B. D. H. has been introduced with a view to presenting barium sulphate in liquid medium of a consistency suitable for use for extemporaneous administration without any preliminary preparation; perfect x-ray photographs can be obtained when Shado-Cream B. D. H. is used.

Shado-Cream B. D. H. is absolutely non-toxic, inasmuch as it is entirely free from soluble barium salts and all other noxious impurities. It is not absorbed by the system, and is readily excreted without undue delay or inconvenience.

The average dose of barium sulphate is four ounces, which quantity is contained in eight fluid ounces of Shado-Cream B. D. H.

The cream may be administered undiluted for oesophageal cases in which a thick cream is required, but it may be diluted with a little water for gastric cases where a thin cream is recommended.

When the oesophagus and the stomach are both to be examined, observation may be necessary from the moment of the administration of the meal, but, as it takes about six hours for the head of the meal to reach the caecum, it is usual for the administration to take place six hours before an examination of the bowel is to be made; a second meal is then given, so that observation can be carried out simultaneously in the stomach and the bowel.

When the bowel only is to be examined, the following method is usual: during the evening preceding the examination, the patient is given one fluid ounce of castor oil. In the morning four fluid ounces of Shado-Cream B. D. H. mixed with a little water are administered. The patient is then directed to abstain from further food, and the examination is started six hours after the administration of the dose. The colon may be examined after the administration of an enema consisting of sixteen fluid ounces of Shado-Cream B. D. H. mixed with about a quart of water and a pint of a thin mucilage of acacia. If desired, a mixture of water and condensed milk in equal quantities may be used.

Shado-Cream B. D. H. is issued as follows:—

Bottles of 24 fluid ounces (containing 40 ounces of barium sulphate), or Winchester quarts of 80 fluid ounces (containing 40 ounces of barium sulphate). It can be obtained from the The British Drug Houses, Ltd., London, N.I.

'BOROCAINE'

'BOROCAINE' is the borate of ethocaine and owes its origin to research carried out by Copeland and Notton (*Brit. Med. Journ.*, September 26th, 1925) in the laboratories of the Department of Pharmacology and Chemistry in the University of Cambridge. This research was undertaken with the specific object of discovering a satisfactory substitute for cocaine, one that would give perfect anaesthesia without risk of toxic effects and would be free from any possibility of inducing the drug habit. This object was successfully attained.

The action of a local anaesthetic depends upon the specific selective affinity of the anaesthetic base for the nerve fibrils. In consequence, the longer the base remains in contact with them before absorption, the greater is its anaesthetic effect. Indeed, the efficiency of a local anaesthetic is in direct proportion to the time in which it remains in contact with the nerve fibrils before absorption.

To produce maximum anaesthetic effects, therefore, it is necessary to combine the anaesthetic base with an acid sufficiently weak to ensure that practically the whole of the salt will dissociate hydrolytically.

Many of these cocaine substitutes have peculiar qualities which are distinctly detrimental, notwithstanding their efficient anaesthetic properties. For example, several of them are highly toxic; some are distinctly irritant in action; others again are precipitated by the body fluids; or they are unstable in solution, and deteriorate on keeping.

As a result of the investigations referred to previously, it has been established that ethocaine borate ('Borocaine') is ideal for use in dental practice, particularly for producing local anaesthesia where either

blocking the main nerve trunk or an infiltration injection is necessary.

'Borocaine' is in no way related to cocaine. It is a pure salt made by the combination of ethocaine and boric acid.

'Borocaine' possesses the following properties which are of distinct advantage in dental practice:—It acts rapidly, it is non-toxic and non-irritant, it does not produce shock, its injection is not followed by the usual after-pain and sloughing of the gums, it does not precipitate when solutions of it are brought into contact with animal tissue, it is non-habit-forming, and its use is not restricted by regulations made under the Dangerous Drugs Acts.

'Borocaine' is compatible with adrenaline (epinephrine) which is usually added to 'Borocaine' solutions to overcome the vaso-dilator properties of 'Borocaine' and to retard its absorption by constricting the capillaries and arterioles, thus prolonging the anaesthesia produced.

'Borocaine' is a stable, white, crystalline powder, freely soluble in cold water and in saline solutions. An aqueous solution of 'Borocaine' has a pH value of about 8.0; that is to say, it is on the alkaline side of neutrality. It is important, therefore, that only perfectly neutral media be employed for making 'Borocaine' solutions.

The injection of an isotonic solution—one which possesses an osmotic pressure equal to that of the tissue fluids and blood—prevents the destruction of tissue cells and consequent irritation.

If dental practitioners prefer to make up their own sterile, isotonic solution with 'Borocaine' powder, only neutral media must be used, as stated above, and adrenaline (epinephrine) should be added in the form of adrenaline borate.

'Borocaine', being less soluble in hot water than in cold, is liable to come out of solution during sterilisation, but it redissolves as the solution cools. It is important to note that 'Borocaine' solutions must not be kept at boiling point for longer than a few moments. When sterilising a 'Borocaine' solution it should be brought to the boiling point quickly and cooled quickly.

Practitioners making up their own isotonic solutions should use sodium chloride or Ringer's solution. The solution must be neutral, and, if Ringer's solution be used, its formula must *not* include sodium bicarbonate.

Dosage.—For all extractions the injection of the 3 per cent. (or 5 per cent.) 'Borocaine' solution should be made sufficiently deep-seated and near to the root extremity of the tooth.

The gum should be dried, and a pledget of 'Borocaine' solution applied. This produces sufficient anaesthesia to make it possible to insert the needle painlessly.

'Borocaine' is non-toxic; thus as many as ten or even more injections may be given without fear of mishap even to children and to patients not in robust health.

For a small root 1 c.cm. of a 3 per cent. solution of 'Borocaine' is sufficient to produce perfect anaesthesia, provided the injection is made slowly, and sufficient time elapses between the completion of the injection and the start of the operation.

A larger quantity of 'Borocaine' solution may be used, but it is only on very rare occasions that more than 5 c.cm. are necessary for one extraction.

Modes of issue.—'Borocaine' is supplied in tablet form; one tablet dissolved in 1 c.cm. of sterile distilled water forms an isotonic solution.

Tablets of 'Borocaine' are supplied *with* adrenaline (epinephrine) unless practitioners instruct otherwise.

For the convenience of those dental surgeons who wish to make up their own solutions 'Borocaine' is issued also in powder form.

It is obtainable from The British Drug Houses, London, England.

THE B. T. L. MONTHLY BULLETIN

MESSRS. BAIRD & TATLOCK have commenced the issue each month of a small bulletin with the above title. This will be of special interest to laboratory workers throughout India. The aim of the *Bulletin* is to place detailed information about new or specialized types of apparatus at the disposal of the laboratory worker. The first number, for example, deals with the applications of the thermionic valve in research and general laboratory work, and gives details of apparatus.

The *Bulletin* also gives details of new catalogues and supplements issued by the firm, new chemicals prepared, and of surplus stock available. The address of the Calcutta branch is Avenue House, Chowringhee Square, P. O. Box 2169, Calcutta.

'HYPOLOID' 'EPINALIN', B. W. & CO. (ADRENALIN AND EPHEDRINE SOLUTION)

'HYPOLOID' 'EPINALIN' presents adrenalin and ephedrine in sterilised solution, ready for immediate hypodermic injection. Each c.cm. contains adrenalin 0.0001 gm. (= 1 in 10,000) and ephedrine sulphate, 0.02 gm. (= 1 in 50).

It is now acknowledged that adrenalin and ephedrine have similar pharmacological actions. The effects of ephedrine, although much less powerful and prompt than those of adrenalin, are more prolonged. In 'Epinalin', Burroughs, Wellcome & Co. offer a medication in which the powerful but relatively transient action of the adrenalin is followed by the continued action of the ephedrine.

Since the issue of 'Epinalin' a demand has arisen for its presentation in a suitable dose for immediate injection. To meet this demand, 'Hypoloid' 'Epinalin' is offered. This product is injected hypodermically when a specially speedy reaction is considered desirable.

'Hypoloid' 'Epinalin' is issued in hermetically-sealed phials of 1 c.cm. in boxes of 10.

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Original Articles

RESULT OF THE FORECAST OF CHOLERA, SMALLPOX AND PLAGUE IN INDIA IN 1931 AND FORECAST FOR 1932*

By SIR LEONARD ROGERS, M.D., F.R.C.P., F.R.S., K.C.S.I.
MAJOR-GENERAL, I.M.S. (Retd.)

Result of cholera forecast for 1931

Assam.—*Forecast.* 1930 monsoon normal, previous cholera low. Moderate increase in 1931. *Result.* Weekly figures in October 1930 to September 1931 slight increase.

Bengal.—*Forecast.* 1930 monsoon normal; low recent cholera. Moderate increase in 1931. *Result.* Weekly figures to October show moderate increase.

Orissa.—*Forecast.* 1930 monsoon in slight defect; low recent cholera. Increase in 1931. *Result.* January-June 1931 rains deficient favouring increased cholera. A marked increase occurred in May to October 1931.

Bihar.—*Forecast.* 1930 monsoon 17 per cent. defect; cholera epidemic in 1930, cholera prevalent in 1931, but less than in 1930. *Result.* Rains May-June 1931 in defect; cholera widely prevalent June to September, but not seriously epidemic as in 1930 after the Allahabad Kumbh Fair.

United Provinces.—*Forecast.* 1930 monsoon good; high recent cholera. Decrease in 1931. *Result.* Moderate prevalence in 1931, much less than in 1930.

Punjab.—*Forecast.* 1930 monsoon good; low recent cholera. Moderate prevalence. *Result.* Low cholera in 1931.

Sind.—*Forecast.* 1930 monsoon in excess; cholera epidemic in 1929. Low cholera in 1931. *Result.* Cholera prevalence low in 1931.

Gujarat.—*Forecast.* Monsoon rains normal in 1930; low recent cholera. Some increase in 1931. *Result.* Some increase in August to October 1931.

Konkon.—*Forecast.* 1930 monsoon normal; low recent cholera. About average prevalence in 1931. *Result.* Moderate prevalence in 1931.

Bombay Deccan.—*Forecast.* 1930 monsoon normal; recent incidence average. About average incidence in 1931. *Result.* 1931 rains in North Deccan 6 inches in defect favouring increased cholera. Cholera prevalent in some excess especially in N. Deccan.

Madras Deccan.—*Forecast.* 1930 rains good; high recent cholera. Decrease in 1931. *Result.* Marked decrease in 1931.

S. E. Madras.—*Forecast.* Average incidence in 1931 unless the 1930 N. E. monsoon is deficient. *Result.* Good N. E. monsoon rains. About average incidence in 1931.

N. E. Madras.—*Forecast.* 1930 monsoon good; low recent cholera. Average incidence in 1931 unless infected from Orissa. *Result.* About average cholera in 1931.

Central Provinces.—*Forecast.* 1930 monsoon in slight defect; average recent cholera. About average in 1931. *Result.* 1931 rains February-June 6 inches in defect favouring increased cholera. Moderately increased cholera in August to October following the low rainfall.

Forecast of the probable incidence of cholera in India in 1932

Climatic conditions.—Once more India has been very fortunate in receiving a well-distributed June to September 1931 monsoon rainfall, except for a deficiency of 91 per cent. in Sind and of 36 per cent. in the neighbouring North-West Frontier Province and the moderate defect of 25 per cent. in the Madras Deccan. Further, the October rain was in considerable excess, especially in all Northern India, the Central Provinces and on the Bombay Coast, but in defect in the South-East and Deccan areas of Madras. The absolute humidities were also very high in October in the areas of abundant rainfall. In 1931 the general incidence of cholera was below the average, as far as can be judged from the very incomplete, but relatively valuable, weekly returns, and much less than that of 1930, with epidemic prevalence in Bihar and the eastern United Provinces, due to the Allahabad Kumbh Fair of that year.

Forecast for 1932.—General. The well distributed 1931 monsoon rains make it very difficult to forecast the incidence of cholera in India during 1932 except on general lines, but I venture to attempt it. The incidence of cholera in India as a whole is not likely to exceed the average and will probably be well below it, unless the winter rains fail.

Assam has had low cholera for four years running, so some increase is likely, but epidemic prevalence is unlikely unless the winter rains fail.

Bengal has had low cholera for the last three years, especially in the Eastern and Northern divisions, so some increase is probable, chiefly in those areas, but not a serious epidemic in view of the good 1931 monsoon.

Orissa had low cholera in 1930 but high incidence in 1929 and 1931, so average to low incidence is to be expected in 1932 if the winter rains do not fail.

Bihar had low cholera in 1931, as is usual after such an epidemic year as 1930. The good 1931 monsoon is likely to result in about average 1932 incidence.

The *United Provinces* had normal monsoon and good October rains, average cholera incidence in 1931 and excess in the two previous years. Average to low incidence is likely in 1932.

* Received by air mail, 15th January, 1932.

The *Punjab* had low cholera in the last three years and good monsoon and October rain in 1931. The cholera incidence is likely to be about the average in 1932, but the South-West is liable to be invaded from Sind.

The *North-West Frontier Province* had low monsoon but good October rain, and the cholera incidence was low in the last three years. Increased cholera is probable in 1932, especially in the southern districts bordering on Sind.

In *Sind* the 1931 monsoon rains failed almost completely, and the cholera rates were very low in 1930 and 1931, but epidemic in 1929 following failure of the rains in the first ten months of the year. In 1932 increased prevalence is likely; this will be liable to reach epidemic proportions if the rains are also short in 1932.

In *Gujarat* the 1931 monsoon rains were normal and cholera incidence has been low in the last three years. In 1932 about average incidence is likely, but probably higher than in 1931, especially if Sind suffers.

In the *Bombay Deccan* the 1931 monsoon rains were normal and cholera incidence was high in 1930 and 1931. Average to low cholera is likely in 1932.

In the *Madras Deccan* the 1931 monsoon rains were 25 per cent. in defect and the October rain was also short. The cholera incidence was in excess in 1930 and about the average in 1931. In 1932 the incidence is likely to be higher than in 1931, but not epidemic as in 1930.

South-East Madras received rather low monsoon and October rainfall, but that of November and December during the North-East monsoon is of more importance in this area; it is not yet known in London except for a cabled report of floods in one area. Forecasts are particularly difficult in this area, as either short rain or floods may be followed by high cholera incidence, but about average incidence seems probable.

North-East Madras in 1931 had rather low monsoon but high October 1931 rainfall, and low recent cholera incidence. Some increase is likely in 1932.

The *Central Provinces* had over the average monsoon and October rain in 1931 and about average cholera incidence in 1931, but a high rate in 1930. Average to rather low incidence is indicated in 1932.

Results of smallpox forecast for 1931

Punjab.—Forecast. Monsoon absolute humidity average. Low smallpox in 1929 and 1930. Moderate prevalence in 1931, but above that of 1930.

Result. Moderate prevalence, but below that of 1930.

North-West Frontier.—Forecast. Monsoon absolute humidity rather low. Smallpox low in 1930. Moderate prevalence, but above that of 1930.

Result. Moderate prevalence, and a little above that of 1930.

Central Provinces.—Forecast. Monsoon absolute humidity about average. Smallpox rate high in 1930. Moderate to low prevalence, and below that of 1930.

Result. Moderate prevalence and slightly below that of 1930.

*Bombay Deccan.—*Monsoon absolute humidity average in North but low in South Deccan. Smallpox high in 1929 and 1930. Lower in North but higher in South Deccan.

Smallpox forecast for 1932

Climatic conditions in 1931.—As explained in former papers the smallpox forecast is based on the absolute humidity data during the monsoon and autumn months of the previous year; high readings are unfavourable to subsequent high smallpox incidence and *vice versa*. At the time of writing, the end of December, these data are only available in London up to the end of October 1931. The 1931 South-West monsoon average readings were about normal in the Punjab and in the North-West Frontier Province, in moderate excess in the Central Provinces and the Bombay Deccan, and in great excess in the Madras Deccan and the United Provinces. The important October absolute humidities were in great excess in all North-West India from the United Provinces to the Frontier Province and in the Central Provinces. In none of the areas dealt with in this forecast was the monsoon humidity in material defect, such as is commonly followed by high smallpox incidence.

Forecast for 1932.—General. The available data only allow of forecasts for North-West and Central India during the annual seasonal rise from November 1931 to the monsoon months of 1932. In nearly all of these the climatic conditions during the second half of 1931 indicate smallpox incidence below the average during 1932.

In the *United Provinces* smallpox incidence was low in 1931, but rather prevalent in the two previous years. The very high absolute humidity in October 1931 indicates low smallpox incidence in 1932, especially if the humidity is also low in November.

In the *Punjab* smallpox prevalence was rather low in 1930 and 1931. The absolute humidity was normal during the monsoon months, but very high in October 1931. The incidence in 1932 is likely to be below the average rate.

In the *North-West Frontier Province* the previous smallpox incidence and the climatic conditions were similar to those of the Punjab, so low smallpox incidence is also likely during 1932.

In the *Central Provinces* smallpox was rather prevalent during 1930 and 1931, and the absolute humidity was high during the monsoon.

months and very high in October. As both these conditions are unfavourable to the prevalence of smallpox the incidence of the disease is likely to be below the average during 1932.

In the *Bombay Deccan* smallpox incidence was low in 1931, but high in the two previous years. The monsoon and absolute humidities were normal in 1931. The incidence in 1932 is likely to be about the average rate.

In the *Madras Deccan* the 1931 monsoon absolute humidity was very high. This indicates a smallpox incidence below the average rate during 1932.

Results of plague forecasts for 1931

Bihar and Orissa.—*Forecast.* High saturation deficiencies in 1930 indicated low plague incidence in 1931.

Result. Prevalence low in 1931.

United Provinces.—*Forecast.* Saturation deficiency high in 1930 hot season; rather low plague incidence in 1931.

in this province from August 1930 to April 1931 average and nearly the same as in the previous similar season.

Forecast of the probable plague incidence in India during 1932

It may be well to recall that high temperatures and saturation deficiencies, represented in the following table by + for moderate, and ++ for greater degrees, are unfavourable to high subsequent plague incidence, and *vice versa*. The data given in the table show that the climatic conditions during 1931 up to October were on the whole distinctly unfavourable to high plague prevalence, in the areas dealt with, during the annual rise from the late rains in the Deccan and the Central Provinces, and from November in North-Western India. I therefore anticipate low plague prevalence in India as a whole during the 1931-32 season. The forecasts for each area are given in the table.

Table of forecast of probable plague incidence in India in 1932

Area	TEMPERATURES		SATURATION DEFICIENCIES			Forecast
	Hot season	S. W. monsoon	First quarter	Hot season	S. W. monsoon	
Bihar and Orissa	++	++	+	++	+	Both the temperatures and saturation deficiencies were all high in 1931 and three of them very high. The 1932 plague incidence should be low.
United Provinces	++	++	—	++	+—	The two temperature data and the hot weather saturation deficiency were much above normal. 1932 plague likely to be below the average.
Punjab ..	+—	—	+—	++	—	Hot weather temperature high and unfavourable, but monsoon temperature and saturation deficiency low and favourable to plague. 1932 incidence about average.
Central Provinces	++	+—	++	++	—	One temperature record and two saturation deficiencies high and unfavourable to plague. 1932 incidence below the average.
North Deccan ..	+—	—	+—	++	—	Hot season temperature high, but two saturation deficiencies low. 1932 incidence average to somewhat low.
South Deccan ..	+	+—	++	+—	+—	Two factors high and unfavourable to plague, and the other three factors normal. 1932 plague somewhat low.

Result. Rather low plague prevalence in 1931.

Punjab.—*Forecast.* Very low saturation deficiency in 1930 hot season. Increased plague probable in 1931.

Result. Prevalence low, but about double that of 1930.

Central Provinces.—Climatic conditions in 1930 slightly unfavourable; about average incidence in 1931.

Result. Incidence during the plague season

General epidemic forecast for India during 1932.—If my deductions from the climatic data of 1931 are approximately correct, which is all that can be hoped for, then India in 1932 should have a comparatively healthy year as far as epidemics of cholera, smallpox and plague are concerned.

Unfortunately the meteorological report for October did not reach the India Office until the last week in December, so I fear this forecast will appear later than that of last year.

MUTATION OF CHOLERA VIBRIOS

(THE CHARACTERS OF THE POPULATION OF A FRESHLY-ISOLATED CHOLERA COLONY, WITH A NOTE ON SOME COLONY VARIANTS OF CHOLERA AND CHOLERA-LIKE VIBRIOS)

By C. L. PASRICHA, M.A., M.B., B.Chir., M.R.C.S., L.R.C.P.
CAPTAIN, I.M.S.

MILITARY ASSISTANT SURGEON A. J. DE MONTE, I.M.D.
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(From the Bowel Diseases Research Department,
Calcutta School of Tropical Medicine and Hygiene)

IN a previous communication (1931) we showed that colonies obtained from the direct plating of a cholera stool may be variable in their agglutinability to a cholera standard serum and in their lysability to the cholera bacteriophage. Some colonies escape infection by bacteriophage present in the stool, and are lysable by the filtrate of the stool from which they themselves were isolated. From the secondary growths that develop after the action of 'natural' bacteriophage on freshly-isolated vibrios, colonies that differ serologically from the parent strain can be obtained, whereas after the action of laboratory-cultured races of bacteriophage on freshly-isolated vibrios or on laboratory-cultured vibrios, serological mutations cannot be so readily demonstrated. We stressed the importance of the study of mutations of the cholera vibrio soon after its escape from the human body and under the influence of agents such as bacteriophage that act on the cholera vibrio in its natural life. The study of mass cultures on laboratory media and the employment of methods—such as freezing and thawing, passage through laboratory animals, and other similar conditions—which the vibrio does not encounter in its natural life, can only give fallacious results. We cannot reproduce in the laboratory the environmental conditions which the cholera vibrio meets with and is influenced by outside the human body, but we can by a study of the component units of a colony follow some of the changes that occur in a vibrio. It is comparatively easy to isolate variant forms from those strains in which the vibrio has already been influenced by adverse circumstances, and a change in its characters has been initiated in the human intestine, but it is necessary to isolate and obtain in pure form the separate units of such a colony before they have been artificially fixed by laboratory culture.

The work to be described is a study of the component units of cholera strains, which in their behaviour showed some deviation from that of ultra-pure cholera vibrios. Some preliminary work on the dissociation of cholera vibrios had shown us that from strains which

were resistant to one or more types of cholera-phage, irrespective of the presence or absence of any contaminating bacteriophage, colonies could be isolated which differed from the parent strain in their agglutinability, in their lysability, and in some instances in their morphology. We studied twelve such strains of cholera vibrio, and from each one of them we were able to obtain colonies either non-agglutinable or less agglutinable than the parent strain. One freshly-isolated strain of cholera vibrio which readily yielded variant colonies and in which we could demonstrate no contaminating bacteriophage was studied in detail and the results are summarised below.

The source and the characters of the strain.—Cholera strain 1290 was isolated on 14th April, 1931, from a case of cholera, 48 hours after the onset of symptoms. The stool (a typical rice-water stool) was inoculated without any previous peptone-water enrichment on a 0.5 per cent. bile-salt agar plate. A typical round translucent colony was picked up and found to be agglutinated to the full dilution by cholera high titre serum (titre 1 in 8,000). It consisted of monoflagellate Gram-negative vibrios, gave a well marked cholera-red reaction, and fermented without gas formation glucose, saccharose, maltose and mannite. The culture was mainly rough by Millon's reaction and was lysable by choleraphage type B (Asheshov, 1930) only. Both the stool and the culture were free from any contaminating choleraphage.

Technique of obtaining dissociated colonies.—The first subculture of the colony from the stool plate was emulsified in normal saline and a dilution made to contain approximately 20 viable organisms per c.cm. This emulsion was spread on a bile-salt agar plate and the isolated colonies obtained examined. These isolated colonies were again emulsified in saline and plated to obtain dissociated colonies, and those showing any variation from the parent strain were further examined by this method.

In an investigation of this kind which entailed the examination of several hundreds of colonies, only three tests were applied to each colony. Besides the microscopic examination, each colony was examined for roughness or smoothness by Millon's reaction, the agglutinability with a standard cholera serum using Dreyer's technique, and the lysability of a young culture of the colony by the three types of cholera bacteriophage was tested on solid medium. In all the experiments a very careful control was kept against any contamination, and repeated examinations of films stained by Gram's method were made.

Nomenclature.—For the sake of brevity the original culture from the stool plate will be referred to as 'colony P'; the colonies obtained by the dilution of the original 'colony P' as colony 'P/X' (X is the number of the colony),

and the colonies obtained by the further dissociation of these colonies as P/X/X and so on. In the following tables only the more important variant colonies are recorded.

TABLE I

Characters of the original colony 'P' and of the colonies obtained by dilution of colony 'P'. Macroscopically all the colonies belonged to the typical cholera colony type and microscopically all were typical monoflagellate vibrios.

Colony	Millon's reaction	Agglutination with cholera type serum	Lysability by choleraphage
Original colony P.	Mostly rough.	1 in 8,000	Lysed by type B only.
P/1	Mostly rough.	1 in 8,000	Lysed by types B and C.
P/2	Smooth	1 in 2,000	Lysed by type B only.
P/3	Equally smooth and rough.	1 in 4,000	Lysed by types B and C.
P/4	Smooth	1 in 2,000	Not lysable.
P/5	Smooth	Nil	Lysed by type B only.

It will be seen that from the original colony 'P' colonies that differ considerably in agglutinability and in lysability by choleraphage were isolated.

Colony P/2 in table I, i.e., one of the colonies derived from the original culture, was replated to obtain isolated colonies.

TABLE II

The characters of colony P/2 and of three of the colonies isolated from it.

Macroscopically all the colonies belonged to the typical cholera colony type and microscopically all were typical monoflagellate vibrios.

Colony	Millon's reaction	Agglutination with cholera high titre serum	Lysability by choleraphage
P/2	Smooth	1 in 2,000	Lysed by type B only.
P/2/1	Smooth	1 in 500	Not lysable.
P/2/2	Smooth	Nil	Lysed by type B only.
P/2/3	Smooth	1 in 500	Lysed by types B and C.

It will be noted that colony P/2 also contains units which are variable in agglutinability and in their lysability by choleraphage.

Colony P/5 in table I, the inagglutinable colony derived from the original culture was replated to obtain isolated colonies.

TABLE III

Characters of colony P/5 and four of the colonies obtained from it. Macroscopically all the colonies belonged to the typical cholera colony type and microscopically all were typical monoflagellate vibrios.

Colony	Millon's reaction	Agglutination with cholera high titre serum	Lysability by choleraphage
P/5	Smooth	Nil	Lysed by type B only.
P/5/1	Smooth	1 in 2,000	Lysed by type B only.
P/5/2	Smooth	1 in 2,000	Lysed by type B only.
P/5/3	Smooth	Nil	Lysed by type B only.
P/5/4	Smooth	Nil	Not lysable.

It will be noted that although the colony P/5 was inagglutinable on isolation, it yields some colonies that agglutinate well. After the third subculture this colony P/5 also became partially agglutinable.

Colony P/2/1 (see table II), a partially agglutinating, bacteriophage-resistant, smooth colony was diluted in saline and plated to obtain isolated colonies.

TABLE IV

The characters of colony P/2/1 and six of the colonies obtained from it. Three different types of colonies were obtained. Microscopically all were typical monoflagellate vibrios.

Colony	Type of colony	Millon's reaction	Agglutination with cholera high titre serum	Lysability by cholera bacteriophage
P/2/1	Normal	Smooth	1 in 500	Not lysable.
P/2/1/1	Normal	Smooth	1 in 2,000	By type B only.
P/2/1/2	Normal	Rough	1 in 2,000	By type B only.
P/2/1/3	Big, opaque.	Smooth	1 in 4,000	Not lysable.
P/2/1/4	Big, opaque	Rough, smooth.	1 in 4,000	By type B only.
P/2/1/5	Tiny, opaque.	Rough	Nil	Not lysable.
P/2/1/6	Tiny, opaque	Rough	1 in 250	Not lysable.

Colony P/2/1/5 (see table IV), an inagglutinable, bacteriophage-resistant, opaque colony was diluted in saline and plated to obtain dissociated colonies.

TABLE V

The characters of colony P 2/1/5 and of three of the colonies obtained from it. The colonies obtained were mostly of the opaque type, with few of the normal transparent colonies.

Microscopically all were typical monoflagellate vibrios.

Colony	Millon's reaction	Agglutination with cholera high titre serum	Lysability by cholera bacteriophage
P/2/1/5	Rough	Nil	Not lysable.
P/2/1/5/1	Rough, partially smooth.	1 in 125	Not lysable.
P/2/1/5/2	Rough	1 in 250	Lysable by type B only.
P/2/1/5/3	Rough	Nil	Not lysable.

Serological reactions of the original culture 1290 and of the dissociated colonies isolated from it. Antisera were prepared by subcutaneous injection into rabbits at five-day intervals of living emulsions of the following cultures:—

I. Culture P 2/1/5 (see table II), strain cholera 1290—a well agglutinating colony.

II. Culture P/2/2 (see table II), an inagglutinable colony isolated from the original strain.

III. Culture P 2/1/5 (see table IV), an agglutinable colony isolated from the original strain.

IV. Culture P 2/1/5/3 (see table V), an inagglutinable colony isolated by further dissociation of the last colony.

The results of the agglutination and cross-agglutination tests are noted below:—

cholera strain which is resistant to one or more types of cholera phage, and by selection of those colonies which behave differently from the parent colony, we can obtain colonies which differ in their morphological, cultural and serological characters. In the experiment summarised above inagglutinable colonies and partially-agglutinable colonies were derived from a good agglutinating colony. Some of the dissociated colonies not only lost the property of agglutinability with cholera serum but also the agglutinogenic power of the cholera vibrio. The serum prepared with the original strain possessed no appreciable amount of agglutinins for the serological variants derived from the original strain. There is no definite order or stability of the serological variants obtained. The evidence in the literature for the transformation of an agglutinating vibrio to a non-agglutinating vibrio is so slender and contradictory that no definite conclusions can be arrived at, and we cannot as yet establish a definite relationship between the vibrio of the disease and the vibrio found in nature.

In a previous communication we showed that a certain number of the cholera-like vibrios which do not agglutinate with a specific anti-cholera serum can under certain circumstances be made to acquire the property of agglutinating with cholera serum. A question of very great importance in the study of cholera is whether a cholera vibrio can lose its specific agglutinability under any circumstances. The

TABLE VI

Agglutination and cross-agglutination tests with a standard cholera serum, antisera prepared with the original strain and the dissociated colonies derived from it.

Antiserum	CULTURE				
	Original colony P (Rough)	Colony P 2/2 (Smooth)	Colony P/2/1/5 (Smooth++) (Rough+)	Colony P/2/1/5/3 (Rough)	Standard Smooth cholera strain
Standard cholera serum	1 in 8,000	Nil	Nil	Nil	1 in 8,000
Prepared with original strain colony P (Rough)	1 in 4,000	Nil	1 in 250	Nil	1 in 3,000
Prepared with colony P 2/2 (Smooth)	Nil	1 in 4,000	1 in 3,000	1 in 4,000	1 in 100
Prepared with colony P/2/1/5 (Smooth-rough)	1 in 50	1 in 4,000	1 in 8,000	1 in 4,000	1 in 50
Prepared with colony P/2/1/5/3 (Smooth-rough)	Nil	1 in 2,000	1 in 2,000	1 in 4,000	Nil

It will be seen from the results of the agglutination and cross-agglutination tests that the colony P/2/1/5/3 isolated from the original well-agglutinating strain is serologically different. A colony which does not react with cholera serum has been derived from a true cholera strain.

Discussion

By subjecting to repeated cultivation on ordinary bile-salt medium a freshly-isolated

results presented above suggest that the loss of agglutinability with a cholera serum occurs in all true cholera vibrios under natural conditions. The argument that the original culture was contaminated with cholera-like vibrios cannot be maintained if these changes are found in a number of strains. We examined twelve strains and obtained inagglutinable or partially-agglutinable vibrios from all the twelve

TABLE VII

The result of the agglutinin absorption and cross absorption experiments, with the standard cholera serum and the antisera prepared from the original agglutinating colony P and a non-agglutinating colony derived from it.

Serum	CULTURES		
	Standard cholera	Original strain colony P	Non-agglutinating colony P. 2/1/5/3
Standard cholera serum absorbed by a standard cholera culture.	Nil	Nil	Nil
Standard cholera serum absorbed by original strain P.	Nil	Nil	Nil
Standard cholera serum absorbed by colony P/2 1/5/3.	1 in 8,000	1 in 8,000	Nil
Antiserum prepared with original strain colony P, absorbed by standard cholera culture.	Nil	Nil	Nil
Antiserum prepared with original strain colony P, absorbed by original strain colony P.	Nil	Nil	Nil
Antiserum prepared with original strain colony P, absorbed by non-agglutinating colony P 2/1/5/3.	1 in 3,000	1 in 4,000	Nil
Antiserum prepared with the non-agglutinating colony P/2 1/5/3, absorbed by standard cholera strain.	Nil	Nil	1 in 4,000
Antiserum prepared with the non-agglutinating colony P/2 1/5/3, absorbed by original strain colony P.	Nil	Nil	1 in 4,000
Antiserum prepared with the non-agglutinating colony P/2/1 5/3, absorbed by the non-agglutinating colony P/2/1 5/3.	Nil	Nil	1 in 200

strains. It is hardly possible that in all these strains the cholera vibrio was living in symbiosis with cholera-like vibrios. The results of the agglutination, cross-agglutination, absorption and cross-absorption tests tend also to disprove this argument.

If we grant that the non-agglutinating vibrios derived from a single cholera colony are cholera vibrios, the question arises, first, why should they have become inagglutinable, and secondly why this change cannot be demonstrated readily *in vitro*.

We have shown that under the influence of natural races of bacteriophage a change in the agglutinability of a cholera vibrio occurs, and it is possible that the loss of agglutinability is related to a process of adaptation for existence outside the human host. Horowitz (1911) suggested that the non-agglutinating cholera-like vibrios represent an extracorporeal phase of the true cholera vibrio. The colony, as isolated from the stool, contains some individuals which have acquired resistance to agents such as bacteriophage and other agents the nature of which we do not know of as yet, and have adapted themselves to a life outside the human body, and in this process of adaptation have lost the property of agglutinability. The usual method of mass culture on laboratory media fails to demonstrate the changes undergone by the units composing the colony. This

perhaps explains the many contradictory reports published in the literature on the variability of agglutinability of a cholera vibrio. The agglutination with a cholera high titre serum constitutes the sole distinguishing test of the true cholera vibrio from the other vibrios, and the solution of the nature of the non-agglutinating cholera-like vibrios that abound in nature in places where cholera exists, is of the greatest importance in the ætiology of the disease. Evidence is presented and a line of investigation suggested by which we can get some insight into the relationship of the cholera-like vibrios to the true cholera vibrio.

Cholera colony variants

Some of the opaque colonies noted in table IV, which developed after repeated subculture from a typical and characteristic form of cholera colony on ordinary bile-salt agar, when allowed to grow for 48 hours or more became still more opaque with yellowish white centres, and developed rib-like ridges radiating from the centre. These colonies resemble the 'circumvallate rugose colonies' of Balteanu (1926), and the form '2' of Eisenberg (1912). At first this type of colony was unstable and tended to revert to the normal type on subculture. By selective cultivation of colonies which exhibited these cultural characters best, this type of variant was obtained in an almost

pure form (fig. 1). Figure 2 which is a micro-photograph taken with transmitted light very

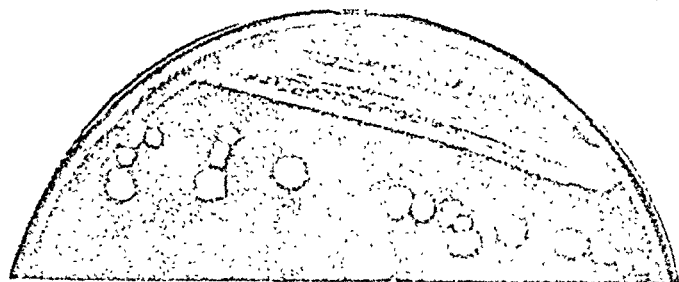


Fig. 1.

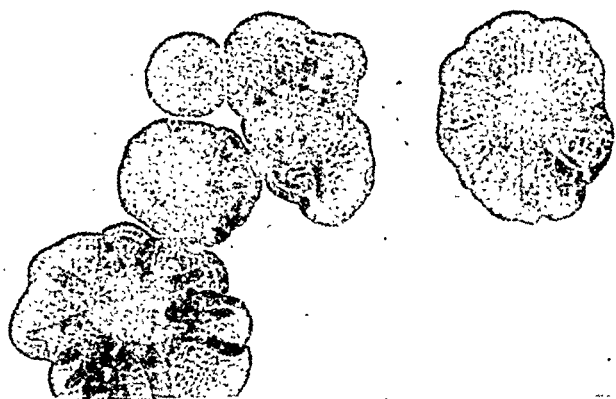


Fig. 2.

clearly shows the formation of ridges; two normal colonies can also be seen.

This variant, although different from the normal type of cholera colony, still possesses the blue translucency of the cholera colony. By long-continued cultivation on bile-salt agar this type of colony became still more opaque and lost all resemblance to a cholera colony. The blue translucency of the normal colony was no longer apparent and the growth became heaped up and prominent, with a depression in the centre of the colony which gave it a crater-like appearance. The surface was hard, irregular, with ridges radiating from the edge of the central depression. This type of colony was also unstable at first and reverted to the normal, or a mixture of the normal transparent and opaque types of cholera colony was obtained. By repeated subculture and selective cultivation this variant was obtained in a stable form. Figure 3 shows this form of cholera colony after four days growth on ordinary bile-salt medium, a normal looking colony marked 'A' may be seen, and another marked 'B' shows the development of bud-like transparent areas.

Characters of the variant colonies.—The colonies of both these variants were soft, spongy and friable in nature. They were adherent to the plate and were not at first easily emulsified in saline or distilled water, but after a time a homogeneous emulsion was obtained which gave the Millon's reaction for smooth cultures. Hanging-drop preparations showed

actively-motile organisms and films stained with carbol-fuchsin showed that the vibrios of both these variants were somewhat longer than the normal type, with a few coccid and long filamentous forms in the field. When stained with Leishman's stain the irregularity of the staining of the vibrios was very marked. They were Gram-negative, and when stained for flagella by Plimmer and Payne's (1921) method (which gives particularly good results with the cholera vibrio) the single polar flagellum was readily seen. Some of the smaller forms of vibrios possessed no flagellum and appeared to be embedded in a mass of pink-staining material, similar to the 'capsulated forms' described by Balteanu. In the fermentation of carbohydrates, indol formation, and agglutination with cholera specific serum both these colony variants behaved like the true cholera vibrio. They were lysable by cholera bacteriophage and the phage-resistant colonies that developed after the action of cholera phage on the second colony variant described above retained the cultural characteristics of the variant form.

Isolation of similar colony variants from cholera-like vibrios.—We were able to isolate colony variants closely resembling the forms described above from two strains of cholera-like vibrios, W 693 and W 785. The original colony characters of both these strains were identical

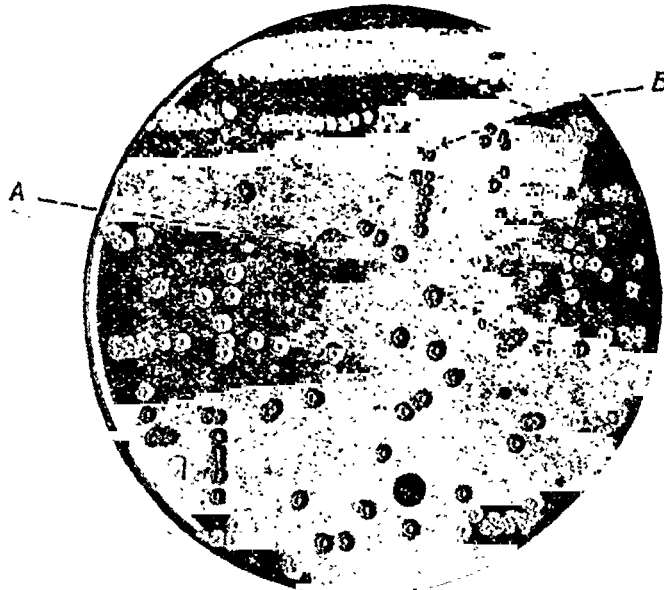


Fig. 3.

with the normal circular translucent colony of cholera vibrio.

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PERCAIN IN SPINAL ANÆSTHESIA

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SPINAL anæsthesia was introduced into surgical practice by Bier in 1889. He used cocaine for the purpose, but the accidents that occurred were so frequent that the drug fell into disrepute immediately. The method was abandoned until 1904 when Forneau introduced stovaine as a new spinal anæsthetic. In the beginning the method was confined to operations of the lower parts of the body only, but in 1908 Jonnesco showed that it can be employed for operations of the upper parts of the body also. Since that time the method of spinal anæsthesia has been used extensively all over the world with very varying results. Some think it to be a very useful surgical procedure while others think it to be a dangerous method. Miller for instance collected a record of 68 deaths in 38,000 operations which gives a very unfavourable ratio of 1 in 500. On the other hand Jonnesco has published a record of 11,000 operations with only two deaths. As pointed out by Clark (1927) most figures given about the mortality of spinal anæsthesia are unfair to the method because it is frequently used in those cases where other anæsthetics are contra-indicated. It is however quite true that whatever drug is chosen to be given intrathecally, the anæsthetist is as important as the anæsthetic, for accuracy and skill in the technique are very important in this form of anæsthesia. Up to this time the novocaine group was, and still is, the most important group whose products are used for spinal anæsthesia. Recently, however, Percain, a quinoline derivative, was introduced as a new local anæsthetic and it is the purpose of this article to study the advantages and disadvantages of this new compound.

If tests of a good local anæsthetic are applied to Percain we find that it satisfies most of the requirements. It is a drug readily soluble in water, stands boiling well, and can be combined with adrenalin with advantage; it has got a specific action on the sensory nerves in concentrations which do not injure the surrounding tissues; the anæsthetic action lasts for a considerably long time and is not permanent. It has, however, got a fairly high toxicity. It is true that the drug is usually used in very

low concentrations and therefore a toxic dose is rarely given, but from our experimental work we find that even in these low concentrations the drug may produce toxic symptoms if proper care is not taken to adjust the dose according to the requirements of the patient.

The two important points one has got to consider when giving a new spinal anæsthetic are the action of the drug in producing a good local action on the spinal roots, and its action on the different systems of the body after absorption from the spinal canal. Drugs introduced into the spinal canal are absorbed rapidly and it is essential to know what symptoms are likely to be produced if a toxic dose is absorbed into the system. We therefore conducted experiments on animals to determine the pharmacological action of the drug and used the compound in about 110 cases in the hospital. The following is the summary of our experimental and clinical observations.

Experimental

Toxicity.—The toxicity of the drug was tried in different animals like cats, dogs and rabbits. It depends upon the concentration of the solution and the rate of injection of the drug. When higher concentrations are used the dose required to kill the animal is smaller than that when low concentrations are used. Similarly rapid injections are more toxic than slow ones. In dogs under morphine-urethane anæsthesia the fatal dose is about 4.5 mgm. per kilo. when 1 in 1,000 solutions are injected into the femoral vein fairly rapidly. The route of injection is an important factor which determines the toxicity of the drug. If the same strength is injected with the same speed into the mesenteric instead of the femoral vein, the lethal dose is about 13 to 15 mgm. per kilo., that is about three times the dose required to kill the animal when the injection is given by the femoral route. Evidently the liver has got the property of detoxicating the drug. The toxicity of the drug is considerably increased in conditions of lowered vitality. The average toxic dose for healthy dogs is about 4.5 mgm. per kilo. of body weight, but in toxæmic conditions artificially induced it was 2.5 to 3 mgm. per kilo. in the small series of experiments that we have conducted.

Action on the cardio-vascular system.—Percain has got a marked toxic action on the heart. Intravenous injections of small doses of Percain produce a marked depression of the heart in *in situ* experiments. Plate II, fig. A, shows the action of Percain on the auricle and ventricle of a cat with a dose of about 0.3 mgm. per kilo. It will be seen from the figure that the heart is considerably depressed and at the same time it becomes very irregular. If the dose is not too large the irregularity passes off in about seven to ten minutes and the heart resumes its normal beat. Preliminary doses of

atropine do not modify the action of Percain on the heart. It appears therefore that the action is one on the heart muscle and not on the parasympathetic mechanism. With smaller doses of Percain the action on the heart is one of marked slowing and some depression. There is no irregularity of the heart.

In perfusion experiments with both mammalian and amphibian hearts the toxic action of the drug on the myocardium is clearly seen. Plate I, fig. D, shows the action of Percain on the amphibian heart. It will be seen that even in such low concentration as 1 in 500,000 Percain exerts a depressant action. A dose of 1 in 200,000 produces a slowing and an irregularity of the heart. Perfusion of the mammalian heart also shows that the heart is depressed in strengths varying between 1 in 200,000 and 1 in 100,000 (Plate I, fig. C). With higher concentrations there is an irregularity of the heart produced.

Volumes of the intra-abdominal organs like the intestines show a rise after an intravenous injection of Percain, showing that the vessels of the splanchnic area are dilated (Plate I, fig. B). The spleen sometimes shows a diminution of volume indicating a contraction of the organ (Plate II, fig. B). This action may be due to the direct action of the drug on the unstriated muscles of the spleen. The effect of Percain on the vessels of the splanchnic area is one of dilatation.

The blood pressure falls, owing to the lessened output of the heart as well as to the dilatation of the blood vessels. The latter action may be due to the direct action of the drug on the muscles of the blood vessels and also to the depressant action on the vasomotor centre. The action on the vasomotor centre will be discussed later.

The important site of action of the drug as far as the cardio-vascular system is concerned is, therefore, on the myocardium. The heart is depressed, slowed and becomes irregular. If however respiration is maintained throughout, the irregularity of the heart and the dose of Percain is not too large, there is always a hope of the heart resuming its normal beat after showing irregularity for a fairly long time.

Action on the respiratory system.—In animals without anæsthesia small doses of Percain produce a stimulation of respiration. This stimulant action is seen in animals under anæsthesia also when very small doses are given intravenously. With slightly bigger doses, however, like 0.5 mgm. per kilo., the action on respiration is one of definite depression (Plate I, fig. B). In cats the action on respiration is more marked than in dogs. A dose sufficient to cause an irregularity of the heart causes a marked depression or a complete cessation of respiration. If artificial respiration is started immediately after the cessation of respiration and maintained for a sufficiently long time, the

animal regains its normal respiratory movements after about five to fifteen minutes, according to the dose injected. Plate I, fig. A, shows complete paralysis of the respiratory centre after a dose of about 1 mgm. per kilo., in a cat. Artificial respiration was started immediately after the cessation of respiration and it is seen that after about six minutes the normal respiratory movements are regained by the animal; immediately after commencing the artificial respiration the condition of the circulatory system improves and after a time the effect on the respiratory centre passes off. In cats respiratory failure always precedes cardiac failure.

Percain has not got any marked action on the bronchioles. Doses like 1 mgm. per kilo. tend to constrict the bronchioles to a slight degree. The marked susceptibility of the respiratory centre to the drug is an important feature of the pharmacological action of Percain.

Action on the gastro-intestinal system.—Percain has got only a feeble action on the movements of the gastro-intestinal tract when injected intravenously. Doses higher than 1 mgm. per kilo. produce a temporary depression of the automatic movements of the small intestines, with a slight loss of the tone of the muscle (Plate I, fig. E). The effect, however, passes off quickly and in a few minutes the normal tone and movements are regained. In perfusion experiments strengths like 1:100,000 produce a diminished tone and lessened amplitude of the automatic contraction (Plate II, fig. D).

Action on the genito-urinary system.—The action of Percain on this system also is not very marked. Movements of the uterus *in situ* are not appreciably affected by doses of Percain which produce a marked action on the respiratory and the circulatory system. In perfusion experiments the tone of the muscle is lessened by concentrations like 1 in 50,000. The secretion of urine is decreased immediately after the administration of Percain. This effect appears to be secondary to the action on the blood pressure for the secretion comes to normal as soon as the level of blood pressure resumes its normal level.

Action on the central nervous system.—In unanæsthetized animals Percain leads to convulsions closely resembling strychnine convulsions. Hypodermic administration of a dose of about 5.0 mgm. per kilo. induces symptoms of paralysis within about ten to fifteen minutes. The animal is unable to support itself on all fours and lies down on the ground with a loss of co-ordination of movements of the limbs. This is followed by stretching of the limbs and contraction of the muscles of the back, giving the typical condition of opisthotonos. These attacks of convulsions recur with lesser frequency after some time and after about two

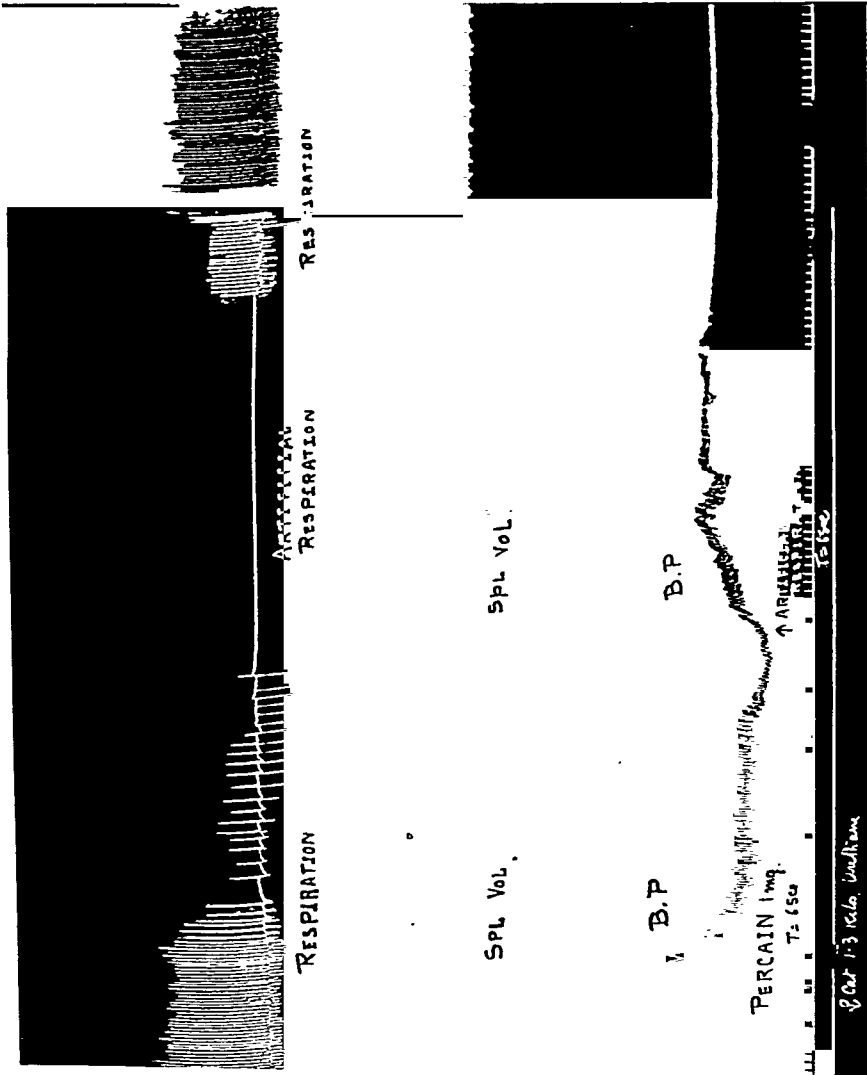


Fig. A.—Upper tracing respiration, middle tracing spleen volume, lower tracing blood pressure. Percain given at the mark. Note marked depression of respiration followed by cessation, slight fall in spleen volume, and marked fall in blood pressure. The latter also shows a slight irregularity of the heart. Artificial respiration started at arrow mark and continued for about six minutes. Note recovery of blood pressure and that after some time respiratory movements are regained by the animal. Respiratory tracing to the extreme right shows that the respiratory movements are regained by the animal.

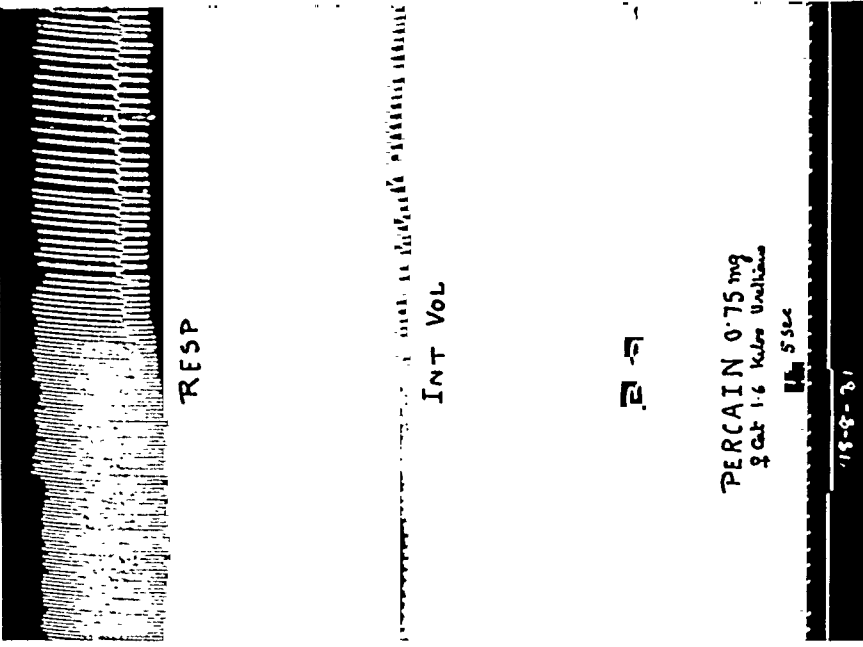
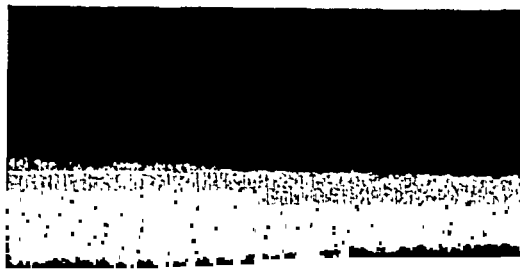


Fig. B.—Upper tracing respiration, middle tracing intestinal volume, lower tracing blood pressure. A small dose of Percain given intravenously at the mark. Note marked slowing and depression of respiration, a rise in the intestinal volume and a fall in blood pressure.

PLATE I—contd



↑
PERCAIN
1-100,000
Isolated Kitten Heart
r = 1 sec



Fig. C.—Isolated kitten's heart perfused with Locke's solution. Percain added at arrow mark. Note the depression of the heart after a dilution of 1 in 100,000 Percain is perfused through the heart.

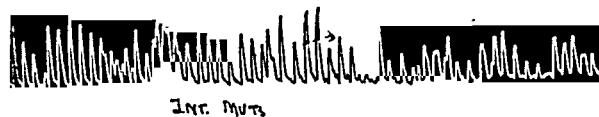
FROG'S HRT



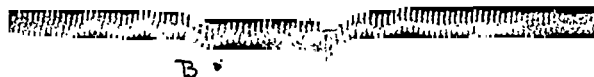
↑
PERCAIN
1-500,000



Fig. D.—Frog's heart perfused with Ringer's. Note a depression of the heart after addition of Percain in 1 in 500,000 dilution.



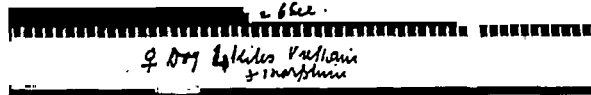
Int. Mvt.



B.

PERCAIN 1mg.
intravenous

2 sec.



♀ Dog Epilepsia Vulgaris
+ morphine

Fig. E.—Upper tracing, movements of the intestines *in situ*; lower tracing, blood pressure. A small dose of Percain given at the mark. Note that there is a slight lessening of the movements of the intestines. The blood pressure is not affected with this dose.

to three hours they cease altogether and the animal is able to perform co-ordinated movements, and moves about.

In animals under anaesthesia the effects of the drug are mostly manifested on the centres in the medulla. The cardio-inhibitory centre is not affected so markedly as the respiratory and the vaso-motor centre. Intravenous injections of about 1 mgm. of Percain per kilo. of the body weight of the animal markedly affect the respiratory and the vaso-motor centres. If artificial respiration is maintained for some time the effect passes off within about ten to fifteen minutes.

Introduction of very small quantities of a 1 in 1,000 Percain solution in the cisterna magna of the cerebro-spinal fluid produce a very marked action on both the respiratory and the vaso-motor centres. The respiratory movements are immediately paralysed but, as in the case of intravenous injections, if artificial respiration is started immediately and continued for about half an hour the effect passes off and the normal respiratory movements are regained by the animal.

Action on the peripheral nervous system.—Percain has got a remarkable paralysing effect on the sensory nerves. A 1 in 75,000 dilution completely abolishes the corneal reflex in rabbits. A dilution of 1 in 1,500 paralyses sensations in the skin when tested by the Weil method. The reaction time in frogs is markedly affected by fairly low concentrations. Percain has not got so marked an action on the motor nerves as it has on the sensory nerves. Its action on the sensory nerves is very marked and there are few drugs at present known which possess so marked an action on the sensory nerves.

Discussion

It will be seen from the experimental data given above that although Percain possesses very high anaesthetic properties, it must be given with caution because it is liable to bring about toxic symptoms even in the high dilutions and small doses in which it is used. The chief alarming symptoms will be respiratory or cardiac failure. Respiratory failure may be due to absorption of the drug into the circulatory system or due to the solutions directly affecting the respiratory centre. Whatever may be the case, the effect on the centre is one of marked depression. When the respiratory centre ceases to function because of an overdose of Percain, it is difficult to rouse it into action by CO₂ or other respiratory stimulants. The only way to treat the patient when he goes into that stage is, therefore, to start artificial respiration immediately and maintain it till the effect of the drug passes off. If the respiratory centre is only depressed and not paralysed, inhalation of CO₂ in oxygen or simple rebreathing may be sufficient to stimulate the centre

into activity. The latter method however should not be persisted in too long and if there is no response from the patient in a reasonable time artificial respiration should be immediately started.

Cardiac failure is due to high concentrations of the drug reaching the myocardium. This may be due to an accident, as for example injection of the solution into a small vein when giving the intradural injection, or due to the rapid absorption of the drug into the circulation. The higher the concentration of the drug injected into the spinal canal, the more rapid will be the absorption. It is therefore better to use as low an effective concentration for spinal injections as possible. When a 1 in 1,500 concentration is used, the absorption is not very rapid and usually beyond a slowing of the heart no untoward symptom is likely to occur. A concentration in the circulation which affects the heart will also affect the respiration and the consequent anoxæmia may also enhance the deleterious action on the heart. If respiration is maintained the effect on the heart passes off by itself and no special treatment is necessary in the majority of cases. It is therefore advisable to start artificial respiration as soon as possible.

These distressing symptoms of cardiac or respiratory depression are, however, very uncommon, occurring perhaps not more than once in one hundred or two hundred cases, when the dose is carefully calculated and adjusted according to the needs of the patient. When prompt measures are taken to treat the patient as a rule they recover. The chief eventuality one commonly meets with in the case of Percain, as in the case of all other spinal anaesthetics, is the fall in the blood pressure.

Intraspinal injections of local anaesthetics cause a fall in blood pressure due to their action on the sympathetic roots. As we do not know of any drug which will counteract this effect directly, we have to look for the control of blood pressure in some other way. The effect of depression of the vaso-motor roots is a dilatation of the blood vessels supplied by those roots, and this dilatation can be controlled by administration of drugs like adrenalin or ephedrine which constrict the blood vessels. It is generally advised to give an injection of ephedrine just before the administration of the spinal injection and in a number of cases we followed this procedure. As a rule, however, the variations of blood pressure are marked when this procedure is adopted. The average variation of blood pressure in our cases was 40 mm. of Hg. If however the injection of ephedrine is given after the spinal injection the variations are less marked. The following graphs illustrate the point.

It will be seen from the figures given below that the variations in blood pressure are less when ephedrine is given about ten minutes

after the spinal injection is given; ephedrine raises the blood pressure and the fall produced by the spinal anæsthetic will be considerably greater if the initial blood pressure is high. It has been shown by one of us (B. B. D.) that the fall of blood pressure will depend upon the initial level of blood pressure and the same dose of a drug under exactly similar circumstances will cause a greater fall of blood pressure if the initial blood pressure is high, and less if the initial level is less. Wide variations of blood pressure are undesirable and so it is always better to inject ephedrine after the spinal

cord and diminishes the resistance to sensory impulses which tend to spread more. It has no action on the nerve trunks directly and so cannot counteract the action of the spinal anæsthetic when it is given along with it. The only way in which it may cause a rise in blood pressure is after absorption into the circulation. It is unnecessary to give strychnine intradurally if this action is desired. We tried strychnine in some of our cases and the results were not encouraging. In one case there was more nausea and tendency to vomiting. This however may not be due to strychnine. The effect

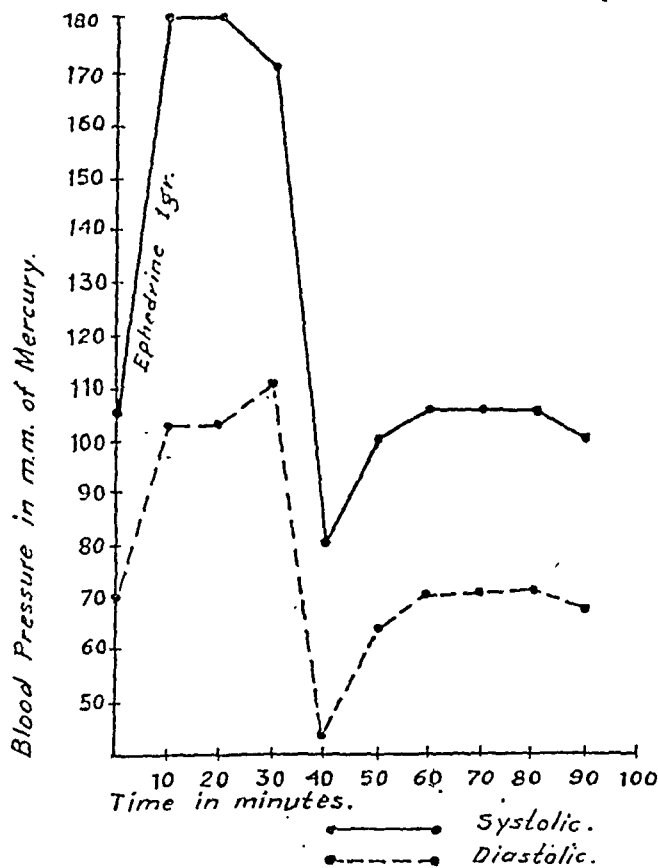


Fig. A.—Ephedrine before.

Shows variations in blood pressure when ephedrine is given before and after the spinal injection.

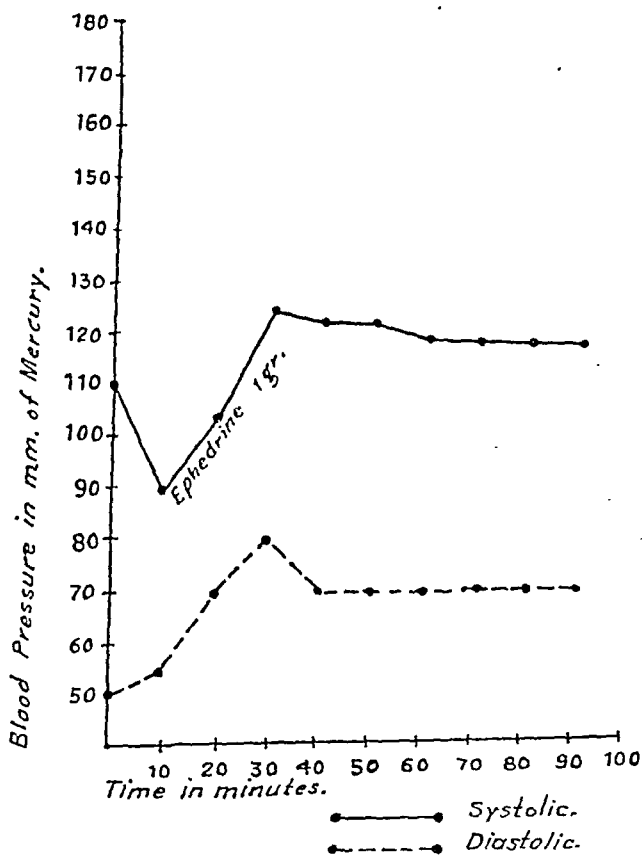


Fig. B.—Ephedrine after.

injection is given. It has sometimes been argued that ephedrine does not properly control the blood pressure if it follows a spinal injection. Ephedrine is a known sympathomimetic drug and its action is known to be on the peripheral nerve terminals. Paralysis of the sympathetic roots therefore will not affect its action. It will be seen from the figure (Plate II, fig. C), that an intravenous injection of ephedrine is quite effective in restoring the blood pressure after it has been lowered by an injection of Percain. From our clinical findings it is quite evident that ephedrine raises the blood pressure quite well when it follows the spinal injection.

Strychnine is sometimes advised for use along with the spinal injection to control the fall of blood pressure. From the pharmacological action of strychnine it is difficult to understand how strychnine can control the blood pressure. Strychnine acts on the sensory side of the spinal

on the level of blood pressure however was not appreciable in any case.

Clinical

Percain is available in ampoules ready for use in strengths of 1:1,500 in 0.5 per cent. saline, or in solid form either as powder or tablets. Solutions of various strengths commonly in use such as 1:1,000, 1:1,500 and 1:2,000 can easily be prepared with 0.5 per cent. saline, using chemically pure sodium chloride and fresh double-distilled water. The quantity of Percain being very small in these solutions the specific gravity depends mainly on the percentage of sodium chloride present. The specific gravity of normal saline is about 1006 and of 0.5 per cent. saline about 1003. As alkali precipitates Percain it should be stored in alkali-free glass like the Jena glass. Addition of minute quantities of acid are recommended to prevent the action of alkalis. The

PLATE II

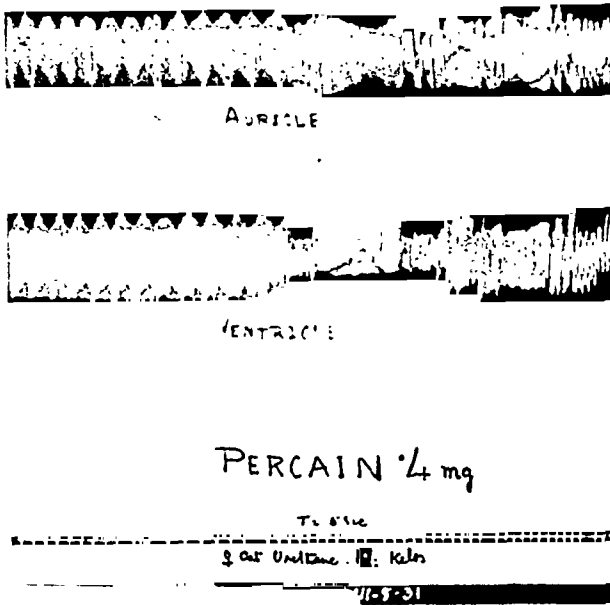


Fig. A.—Shows the effect of Percain on the auricle (upper tracing) and the ventricle (lower tracing) of a cat. Note the depression and irregularity of both the auricle and the ventricle.

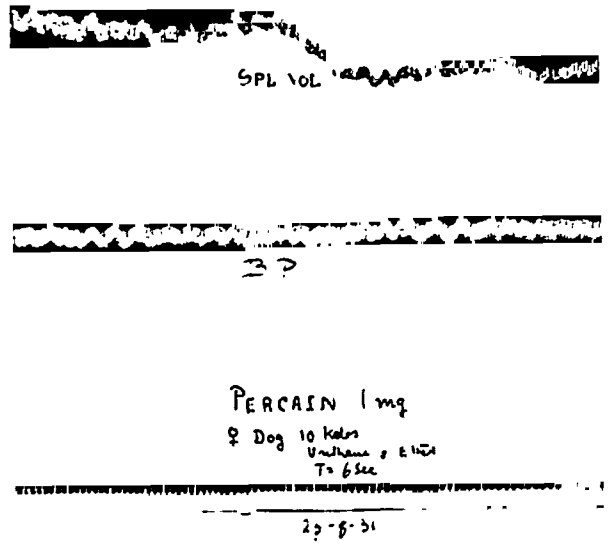


Fig. B.—Upper tracing spleen volume, lower tracing blood pressure. Note that a small dose of Percain produces a fall of the spleen volume, indicating a contraction of the organ.

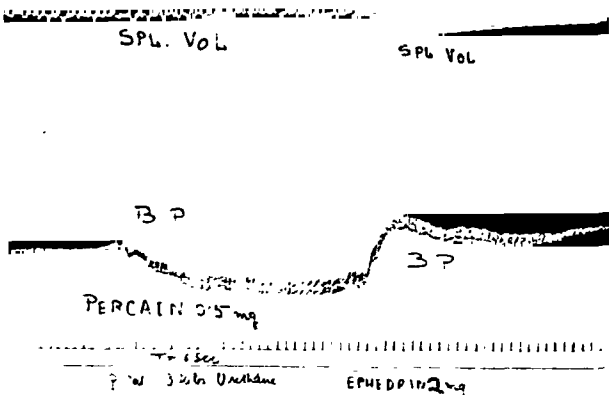


Fig. C.—Upper tracing spleen volume, lower tracing blood pressure. Percain and ephedrine given intravenously. Note ephedrine corrects the fall of blood pressure produced by Percain.

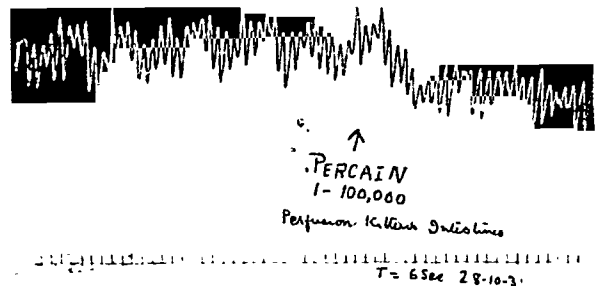


Fig. D.—Shows the movements of an isolated piece of small intestine of a kitten. Percain added at the arrow mark. Note that a 1 in 100,000 dilution of Percain diminishes the tone of the intestinal muscle.

solutions are said to keep well indefinitely, but we invariably found a fungus growth after about seven to ten days in a humid warm atmosphere. This was overcome by boiling the solutions in the stock containers and fitting them with tight rubber stoppers before allowing them to cool. This procedure is well worth the trouble in view of the fact that solutions cost only a tenth of the stock ampoules and economy counts for much in large routine hospital practice.

Spinal anæsthesia is only to be regarded as extensive regional or nerve block, and to secure this end Percain is introduced in large volume of dilute solutions into the sub-arachnoid space round the spinal nerve roots. As has been discussed before the effects will be local and general. With the dilute solutions used, absorption is very slow and the local action predominates over the general. Sensory fibres are affected more than the motor. In the upper abdomen operations it is necessary to obtain both analgesia and muscular relaxation by soaking both the ventral and dorsal roots.

The specific gravity of the cerebro-spinal fluid is estimated by various workers to be from 1001 to 1008. In the limited number of investigations we have made it was found to be between 1006 and 1008. It is thus higher than the specific gravity of Percain solutions, the latter being only 1003. Gravitational diffusion does not take place with these light solutions as with heavy ones. In other words a column of the anæsthetic fluid bathes a definite length of the spinal roots, limited in proportion to the volume injected, and by virtue of its high dilution and low specific gravity there is no upward spread towards the neck to involve the phrenic roots nor any toxic effects due to absorption into the general circulation. It will thus be seen that with these low specific gravity solutions, if the dose is properly calculated after measuring the spine, control can be effected by putting the patient in the Trendelenburg position which helps gravitational diffusion in the desired direction.

Following the technique of Howard Jones (1930) injections are made with the patient in the right lateral position and then changed over to the prone with a slight Trendelenburg position. In this position the anterior roots are dependent and the anæsthetic fluid being lighter than the cerebro-spinal fluid floats up and is applied in greater concentrations to the posterior roots. At the end of ten minutes the patient is turned over on his back, allowing the anterior roots to be bathed in the anæsthetic fluid. It is stated that failure to adopt this prone position at the outset leads to an unsatisfactory analgesia, in the presence of good muscular relaxation. In some of our lower abdomen cases such as hernias, only the dorsal decubitus with a slight Trendelenburg position was employed after the injection, with gratifying

results. It is rather difficult to explain the results in the light of the technique described above. A large number of cases including the upper abdomen cases must be tried on the lines of this technique before any conclusions can be drawn.

Dose.—In upper abdomen cases it is necessary for the level of analgesia to pass up to the level of the fourth dorsal vertebra and at any rate not to spread beyond the level of the second dorsal. Between this level and the origin of the phrenic roots, that is the fourth cervical, there is a good margin of safety. The dose injected therefore depends upon the length of the spine. The necessity for this step becomes obvious when we realize that the quantity of the cerebro-spinal fluid below the sixth cervical vertebra is only 30.0 c.cm. (Pannett). Accordingly the capacity of the sub-arachnoid space below the sixth cervical space is gauged by measuring the spine from the sixth cervical vertebra to the mid-point of the inter-iliac crest line in the sitting posture of the patient with flexion of the body. Measurements in our series of about 200 cases varied between 15½ to 21 inches and are nearly the same as those obtained by Howard Jones. To provide a wide margin of safety, Howard Jones (1931) suggests as a working rule a deduction of 4 for men and 6 for women from the number of the spinal measurement in inches, and the number thus obtained gives the number of cubic centimetres to be injected in the spinal canal. Having regard to the poorer physique of our patients and their lower vitality, we make an allowance of 6 for men, 8 for women and calculate the dose accordingly. Injections are made in the inter-vertebral space between the first and the second lumbar vertebræ. For caudal block the dose is correspondingly less and injections are made between the fourth and fifth lumbar vertebræ. The general condition of the patient must also be taken into account when calculating the dose. In a male adult with good vitality, therefore, if the measurement between the sixth cervical vertebra and the mid-point of the inter-iliac line is 18 inches, the dose for that patient will be eighteen *minus* six, that is twelve cubic centimetres. Similarly in the case of a female patient if the measurement is sixteen inches, the dose to be injected will be sixteen *minus* eight, that is eight cubic centimetres, of a 1:1,500 solution.

A preliminary injection of ¼ gr. of morphine and 1/100 gr. of atropine is very useful in quieting the patient. The spinal injection is made by a sharp, short-bevelled, rustless needle of 1.2 mm. bore and is no more painful than a hypodermic injection. The cerebro-spinal fluid is not withdrawn but allowed to escape till the syringe is attached. As a rule not more than 0.5 to 1.0 c.cm. of the fluid escapes, depending on the pressure of the fluid. Care is taken to

maintain proper sterility of the solutions and instruments used for the injection are sterilized. A simple test for ascertaining the level of analgesia is to apply a towel clip at various levels till the patient winces. Inability to cough when asked to do so and a boat-shaped configuration of the abdomen denote muscular relaxation. Blood pressure and pulse estimations are made at ten minute intervals till the end of the operation.

The immediate effects of the injection on the patient are:—

- (i) A feeling of warmth.
- (ii) Numbness of the limbs, extending over to the trunk and a feeling of relief from pain if it existed before.
- (iii) Heaviness of the limbs and a dragging sensation leading to inability to move them.
- (iv) Nausea, thirst and a feeling of suffocation.

The symptoms of warmth, nausea, thirst and suffocation can be explained by changes in the circulatory and respiratory systems. The following is the routine adopted to combat these symptoms.

- (i) Application of a cold towel round the face and neck.
- (ii) Encouraging the patient to breath deeply or to rebreathe through a wide bore Hewitt's inhaler together with oxygen and if necessary with CO₂.

(iii) Increasing the Trendelenburg inclination.

In most of the cases these means have given complete relief to the patient. The symptoms occur mostly within the first twenty minutes of the injection. Some patients show restlessness from having to lie still in one position during the period of operation of one to one and a half hours. Nausea and a sensation of dragging were evident in some cases during traction on the stomach but disappeared on relieving the tension.

Out of a total of over 200 cases of spinal analgesia Percain was used in 110, novocaine in 94, and in the remainder apothesine, etc. In the following operations Percain was used:—

Cholecystectomy	..	..	2
Duodenal ulcer	..	..	41
Exploratory laparotomy	..	..	1
Splenic anæmia	..	..	1
Renal calculus	..	..	1
Lower abdomen cases including hernias, enlarged prostates, vesical calculus, etc.	..	..	59
Lower extremity operations, etc	..	..	5

The youngest of the patients was fifteen years old while the oldest was sixty.

The following table gives the details about the dose, height of analgesia, length of spine, etc.

TABLE I

Gives the age, weight, dose, fall of blood pressure, height of analgesia and other details, of upper abdomen operations. 1:1,500 Percain was used in all cases except those marked (T)

Number	Name	Age in years	Weight in lbs.	Disease	Length of spine in inches	Site of injection	Dose in c.cm.	Ephedrine	Height of analgesia	Fall of B. P., mm. of Hg.	REMARKS
1	N. M.	30	87	D. U.	18	Li	11	B	D3	Nil	Fall of 10 mm. after 1 hour. Headache; A. S.
2	M. R.	20	87	D. U.	17	Li	9	B	D4	30	A. S.
3	K. G.	40	..	D. U.	17	Li	9	B	D4	30	A. S.
4	D. A.	40	86	D. U.	18	Li	10	B	D4	..	A. S.
5	B. L.	30	120	D. U.	18½	Li	10	B	D4	60	U. S. Pull on peritoneum felt.
6	N. A.	30	110	D. U.	19	Li	12	B	D2	Nil	A. S.; B. P. higher than normal throughout operation by 20 mm.
7	B. R.	25	94	D. U.	18½	Li	11	B	D4	40	A. S.
8	C. A.	20	72	D. U.	17	Li	9	B	D4	40	A. S.
9	S. N.	50	95½	D. U.	19	Li	12	B	D2	35	A. S.; no effect of ephedrine.
10	P. A.	50	106	D. U.	18¾	Li	12	B	D4	65	A. S.
11	P.	40	74	D. U.	17¾	Li	10.5	B	D5	50	Slight U. S.
12	C. P.	45	84	D. U.	17¾	Li	10.75	B	D5	Nil	B. P. rose by 15 mm. gradually. Duration less than 1 hour; E.

TABLE I—*contd*

Number	Name	Age in years	Weight in lbs.	Disease	Length of spine in inches	Site of injection	Dose in c.cm.	Ephedrine	Height of analgesia	Fall of B. P., mm. of Hg.	REMARKS
13	V. S.	25	83	D. U.	16	Li	9.5	B	D4	35	A. S.
14	M. A.	20	77½	Splenic anaemia. D. U.	15½	Li	10	B	D3	50	A. S.
15	S.	20	93	D. U.	18	Li	12	B	D4	100	A. S.; B. P. rise 75 mm. from ephedrine.
16	S. R. A.	35	105	D. U.	19	Li	13	B	D2	30	A. S.; adrenaline also given.
17	G. G.	40	...	D. U.	18	Li	11.5	B	D4	85	A. S.; emaciated.
18	D. V.	50	101	D. U.	19	Li	12	B	D4	15	A. S.; E. at the end of operation.
19	M. K.	30	108	D. U.	18	Li	13	B	D2	30	A. S.; ephedrine, no effect on B. P.
20	C. A.	35	108	Exploratory laparotomy. D. U.	18½	Li	12.5	B	D1, D5	25	U. S.; E. at end.
21	A. V.	30	101	Strangulated hernia. D. U.	17	Lii	13	B	D2	50	A. S.
22	R.	25	..	Strangulated hernia. D. U.	18	Lii	4 (T)	B	D7	60	A. S.
23	D. N.	31	95	Cholecystitis	19	Li	8 (T)	B	D4	55	A. S.
24	B. K.	40	130	Renal calculus.	19	Lii	8 (T)	B	D3	20	A. S.
25	K. R.	25	72	Enlarged prostate.	16½	Lii	6 (T)	B	D8	Nil	A. S.; traction on kidney felt.
26	P. E. N.	40	..	D. U.	..	Li	18	A	D4	30	A. S.
27	C. R.	50	122	Enlarged prostate.	18½	Liv	4	A	Umbilicus.	50	A. S.; arterio-sclerosis. Myocardium?
28	R. P.	18	82	D. U.	17	Li	10.5	A	D3	45	A. S.
29	E. A.	30	126	D. U.	18	Lii	8 (T)	A	D4	10	U. S. towards the end, G. & O.
30	N. A.	34	124½	D. U.	19	Li	8.5 (T)	A	D4, D5	20	U. S.; G. & O.
31	K. E.	35	89½	D. U.	18	Li	12	A	D4	29	U. S.; novocaine, morphine not given.
32	K. Ay.	34	105	D. U.	19	Li	13	A	D4	10	A. S.
33	D. A.	25	118	D. U.	18	Li	12	A	D3	5	A. S.
34	K. A.	22	89	D. U.	16½	Li	9.5	A	D4	20	A. S.; duration 1½ hours.
35	S. A.	30	110	D. U.	19	Li	12.5	A	D4	?	A. S.
36	B. K.	30	118	D. U.	18	Li	12	A	D4	11	A. S.
37	S. S.	18	..	D. U.	19	Li	13	A	D4	10	A. S.
38	C. A.	45	94	D. U.	19	Li	13	A	D3	15	A. S.
39	J. S.	30	98	D. U.	18	Li	12	A	D4	26	A. S.
40	P.	35	81	D. U.	18	Li	12	A	?	20	A. S.; nervous touch interpreted to be pain.
41	B. U.	30	96	D. U.	18	Li	12	A	D1	9	A. S.; respiratory embarrassment; CO ₂ and O ₂ .
42	A.	35	86	D. U.	18.5	Li	12	A	D2	10	A. S.
43	B. A.	36	86	D. U.	18	Lii	11.5	A	D4	Nil	A. S.

D. U. = Duodenal ulcer;
A. S. = Analgesia satisfactory;
U. S. = Analgesia unsatisfactory

L. = Lumbar;
D. = Dorsal;
E. = Ether;
G. & O. = Gas and oxygen;

A. = After spinal injection.
B. = Before spinal injection.
(T) = 1 : 1,000 solution.

It will be seen from the table given above that the dose calculated according to the method discussed gives a fairly good analgesia in a great majority of cases. The minimum weight of the patients in our series was 72 lbs. or about 33 kilo. and the dose in his case was 9.0 c.cm. of a 1:1,500 concentration or about 6.0 mgm. of Percain. There is therefore a very wide

margin of safety when we take into consideration the probable toxicity of the drug due to absorption in the circulatory system. The concentration of 1:1,500, which was the one used except a few cases only, gives a completely satisfactory analgesia. It is thus possible to get the desired local action without the undesired general action due to absorption of the

drug, when a 1:1,500 concentration is used in doses calculated according to the method given. The level of analgesia in most of the cases has gone up to the 4th dorsal vertebra. This level is generally sufficient for any upper abdomen operation and thus the degree as well as the height of analgesia are satisfactory. Variations in blood pressure are seen more in those cases in whom ephedrine was given before the spinal injection. The first twenty-five cases in the table received ephedrine before, and the remaining cases after the spinal injection. It will be seen from the table that the variations in the former are much more marked than in the latter, and that the average fall of blood pressure is about twice as much when ephedrine is given before than when it is given after the spinal injection. It appears also likely that the psychic factor may influence the analgesia in some cases even though the dose is calculated correctly. This is a disadvantage of the method and the nature of the drug employed has nothing to do with it.

Complications commonly met with are nausea, vomiting, headache, shivering, backache, circulatory and respiratory disturbances and lung complications. Nausea occurred within ten to fifteen minutes after the spinal injection and particularly in upper abdomen cases when the stomach was pulled upon, and disappeared when the traction was released. Vomiting took place generally two to three hours after the operation and was aggravated by large drinks of water. It was neither severe nor persistent, and occurred in about 1.8 per cent. of the cases as against 10.6 per cent. under our novocaine series. Some cases developed rigors about two to three hours after the spinal injection, which lasted for about half to one hour. Most of these cases gave a history of malaria.

Headache constituted the commonest sequela. The degree of severity varied and only in one case did it last for three days. It was chiefly of trigeminal distribution, bitemporal or occipital. Almost all cases were relieved by aspirin and a low head position. Only one case was obstinate and neither aspirin, large fluid intake nor intravenous hypertonic saline was of any avail. The incidence of headache in our series was 6.3 per cent. as compared with 15.9 per cent. under novocaine. The incidence of headache was remarkably small in the upper abdomen cases in contrast to its incidence in the less serious short operations. It might be due to rectal saline and perfect rest in the former cases. In only a few cases procainolysis was tried with good results. Lowering of the pressure of the cerebro-spinal fluid is one of the causes of headache in spinal anaesthesia. Leakage through the site of puncture may be responsible for the low pressure, and the risk of leakage can be minimised by using very fine needles. Rectal saline helps to restore the cerebro-spinal fluid pressure to normal.

There was only one case of resistant backache in the series. On further investigation it was found that the patient had syphilis and the backache disappeared with antisyphilitic treatment.

Lung complications occurred only in the upper abdomen series. In one case there was bronchitis, in another broncho-pneumonia, and in a third partial atelectasis. The last was a case of suspected tuberculosis of the lungs and was considered unsuitable for general anaesthesia. It is difficult to assess the degree of blame due to the spinal anaesthesia itself. In all the three cases recovery was complete.

Circulatory disturbances consisted only of a fall of blood pressure. In the great majority of cases the fall was controlled by ephedrine. The practice of giving ephedrine 10 minutes after the spinal injection led to a smaller variation of blood pressure and maintenance of a normal or slightly higher than normal blood pressure throughout the surgical procedure. In some cases ephedrine and adrenalin fail to control the blood pressure, particularly in those with sclerosed vessels and deranged myocardium. Age does not seem to influence the fall of blood pressure. The greatest fall of blood pressure in our series was in an individual 20 years old whose blood pressure, preliminarily raised by ephedrine, fell by 100 mm. of Hg. The level of analgesia bears only a limited relation to the fall of blood pressure. The higher the level the greater is the fall of blood pressure, due to a larger number of vaso-motor roots being involved.

Respiratory disturbances are not of common occurrence. In one case there was marked depression of respiration but the patient responded to the usual measures, while in another there was a very marked depression ending in cessation of respiration and a fatal result.

Psychic disturbances were symptoms of anxiety as to what might happen before the operation was completed, and restlessness due to the position in operation. Some interpreted tactile sensations as pain and were not accommodating. Supplementary gas and oxygen is admirably suitable in these cases.

Failures.—These include incomplete analgesia and evidence of psychic disturbances. The former is possible either with a faulty technique or insufficient dosage. The use of fine, sharp, short-bevelled, rustless steel needles and calculation of the dose after measurements of the spine will give satisfactory results. There is a possibility of escape of the analgesic into the subdural space if the bevelled point is not completely in the sub-arachnoid space. When the cerebro-spinal fluid escapes on withdrawal of the stylette the needle may be pushed in a little more before the syringe is attached. This ensures the deposition of the entire solution in the sub-arachnoid space. A preliminary injection of morphine, supplemented by giving gas

and oxygen for inhalation when necessary minimise psychic disturbances to a considerable extent.

Mortality.—There were two deaths in our series. One was a moribund case of volvulus of three days duration in which hardly any anæsthetic was safe. A dose, smaller than the usual dose employed by us, produced respiratory embarrassment from which the patient did not recover. The other patient had received a dose of 18 c.cm. of a 1:1,500 solution. There was respiratory embarrassment in this case also, due either to direct diffusion or to rapid absorption, resulting in cessation of respiration.

Discussion.—It will be seen from the clinical observations here recorded that Percain is a reliable spinal anæsthetic when employed in proper concentrations and doses. Untoward symptoms such as headache, nausea and vomiting were less common in our series with Percain than with novocaine. Fall of blood pressure is a constant feature of this as with all other spinal anæsthetics, but the fall rarely gives occasion for anxiety. Respiratory embarrassment is a feature of toxicity and should be attended to immediately. Rebreathing or inhalation of CO₂ and oxygen is usually sufficient for the patient to recover, but in a small proportion of cases artificial respiration may be indicated if these measures fail. A proper choice of cases is essential, and the not uncommon practice of employing the spinal method in cases where other anæsthetic agents and methods cannot be employed is fallacious and reflects discredit on both the method as well as the drug. The very young and very old patients as well as those under toxæmic conditions are as unsuitable to the spinal as to the inhalation anæsthetics.

Summary and Conclusions

(i) Percain is a drug of fairly high toxicity and its toxicity is increased in toxæmic conditions.

(ii) It has a powerful action on the cardio-vascular system and produces a slowing and irregularity of the heart in small doses. Blood pressure is lowered and the splanchnic vessels are dilated.

(iii) It markedly depresses the respiratory centre and this action is manifested when the drug is injected intravenously or applied locally by injecting it into the cisterna magna.

(iv) On the central nervous system it acts as a convulsant. Its action on the sensory nerves is very marked, analgesia being produced in very low concentrations.

(v) Clinically it has been found to be a drug of high potency and toxicity and great care is necessary in its administration. Proper technique makes for success.

(vi) Blood pressure is better controlled by giving ephedrine ten minutes after the spinal injection.

(vii) Respiratory embarrassment is more to be dreaded than circulatory disturbances, but is much less in frequency.

(viii) Headache is the only important undesirable sequela, and is amenable to treatment.

(ix) The duration of analgesia and the degree of muscular relaxation are the distinctive features of the drug when given by the spinal method.

Our thanks are due to Dr. Howard Jones of Charing Cross Hospital, London, for his valuable suggestions and help. We are also grateful to Lieut.-Col. F. J. Anderson, M.C., M.B., B.S., F.R.C.S., I.M.S., First Surgeon, King George's Hospital, and to Dr. P. Sharma, M.B., C.M., Second Surgeon, King George's Hospital, for allowing us to publish the report of their cases. We are especially grateful to Col. Anderson for his valuable criticism and help throughout this investigation.

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AN EPIDEMIC OF JAUNDICE IN THE ALIPURAM JAIL, BELLARY (SOUTH INDIA)

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and

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IN April 1931, we were informed by the authorities of the Alipuram Jail, Bellary, of the prevalence at the time of an epidemic of jaundice in the jail population there. An Investigation Unit of the Institute under the charge of one of us (R. S. R.) was therefore sent there to study the nature of the infection and to ascertain particularly if it was of leptospiral origin, as amongst the jail population there were some who had been resident in the Andamans for some time, where leptospiral jaundice was known to occur.

The epidemic occurred in the months of February, March and April. While a few cases were noted during the same months in the preceding two years, the epidemic assumed serious proportions this year, as far as the total number of admissions were concerned. Similar epidemics have been reported in the past in other parts of India. Some of these were considered, although on insufficient grounds, to be due to *Leptospira icterohæmorrhagæ*. Turkhud (1931) has recently reported an outbreak with 14 cases in all, in a school in Kodaikanal (S. I.). He concluded that on clinical grounds the diagnosis of Weil's disease

seemed justified. As noted by Taylor and Goyle (1931) who have also summarised the available data, a complete bacteriological examination of epidemics of such a nature is essential. At the time of the arrival of the Unit, the present epidemic was already on the decline. A few cases however were studied in detail, and the results obtained are summarised in this paper.

Course of the epidemics

The epidemics have had a definite seasonal prevalence. The following table gives the total population in the jail and the total cases recorded in each month from January 1928 to April 1931.

General condition of the infected place

Alipuram Jail is situated about 3 miles from Bellary town. The climate is dry and rainfall very scanty.

The jail population is comprised mainly of Moplah convicts, but there was a considerable number of short-term prisoners up to the middle of March when they were all released. A great number of these had suffered from jaundice. Epidemics of cerebro-spinal meningitis and dysentery, both bacillary and amœbic, had occurred among the ordinary convicts some years ago.

The prisoners were housed in barracks which were airy and well ventilated. The flooring was of Cuddapah slabs. The infection was not

TABLE I

(Giving the monthly admissions in 1928-1931)

Months	1928		1929		1930		1931	
	Jail population	Cases	Jail population	Cases	Jail population	Cases	Jail population	Cases
January ..	..	..	2,312	..	1,647	..	1,921	19
February ..	..	..	2,312	..	1,675	4	1,895	62
March ..	..	..	2,207	18	1,575	3	1,602	120
April ..	3,452	1	2,123	24	1,531	4	..	87
May ..	..	..	2,085	11	1,492	..	(till 10-4-31).	
June ..	..	..	2,033	14	1,492	..	..	..
July ..	..	..	2,026	7	1,478	..	..	..
August ..	..	..	1,992	1	1,478	2	..	..
September	..	..	1,970	1	2,484	0	..	..
October ..	2,554	1	1,883	1	2,415	1	..	..
November	..	..	1,862	3	2,345	0	..	..
December	2,352	1	1,724	2	2,120	0	..	..

It is seen that the epidemic occurs mainly in the spring—January to April—and subsides completely when the hot weather sets in.

In the preceding two years cases were recorded only among the convicts, but this year we are informed that a few cases occurred amongst the servants of the superior jail staff and a few cases were also noted in the inmates of the neighbouring convent. Inquiries made at the headquarters hospital showed that the town had enjoyed complete freedom from the infection.

confined to any one of the many residential blocks.

The diet consisted of rice, dhal, vegetables and beef. It remained unaltered throughout the year. The provisions were stored in a special block with a good rat-proof flooring of Cuddapah slabs.

The water supply was different from that of the town. The neighbouring convent had the same water supply.

The jail population was working in different ways as weavers, blacksmiths, carpenters, etc.

There was no agriculture to speak of, but a few were engaged in gardening. The infection occurred among all these different classes of prisoners.

There were 8 arrivals from the Andamans in 1929, 4 in 1930, and none up to the time of the visit of the Unit in 1931. Of these none gave a history of having suffered from jaundice either in the Andamans or here.

Clinical features of the cases

The clinical symptoms in all the cases were very mild. There was no marked prostration, and in the majority of cases the patients themselves did not complain of any particular

Of the 21 cases investigated only 4 had pyrexia, the duration being 5 days in one case, 3 days in another and 1 day in the remaining two. In no case was hyper-pyrexia recorded. In the two cases where the fever lasted for more than two days the temperature was remittent and came down by lysis. Jaundice was not intense. Presuming that the patients were picked out on the first day the icterus appeared, it took about a month for the jaundice to clear away completely. It was marked during the first week.

Hæmorrhages of any kind were not recorded in any case. The onset of the disease was not directly preceded or accompanied by any kind

TABLE II
(Some of the details of the cases investigated)

S. No.	Residential block	Occupation in jail	Duration of illness at the time of laboratory investigation	Duration of fever	Jaundice
1	9	Blacksmith	14 days	Nil	+
2	5	Rope weaving	15 "	Nil	+
3	3	Overseer	15 "	3 days	+
4	3	Stores	13 "	Nil	+
5	5	Weaving	22 "	1 day	+
6	2	Do.	18 "	1 "	+
7	8	Gardening	10 "	Nil	+
8	2	Weaving	12 "	Nil	+
9	2	Do.	5 "	5 days	++
10	2	Do.	19 "	Nil	+
11	8	Stores	6 "	Nil	+
12	2	Weaving	7 "	Nil	+
13	3	Sweeper	2 "	Nil	++
14	9	Carpentry	5 "	Nil	++
15	5	Rope weaving	3 "	Nil	++
16	8	Sweeper	3 "	Nil	++
17	9	Carpentry	4 "	Nil	++
18	4	Sweeper	1 day	Nil	++
19	4	Bhisty	1 "	Nil	++
20	14	Cooking	1 "	Nil	++
21	2	Weaving	1 "	Nil	++

symptom. The cases were discovered at the morning parade by the Medical Officer on duty on noticing the icteric tint of the conjunctivæ. There were practically no pyrexial symptoms.

of gastric disturbance in any case. The liver could just be felt below the costal margin in a few cases, but it was not tender. Splenic enlargement was not noticed. The nervous

system was normal. Meningeal symptoms were absent.

The blood picture was normal. The following is a typical differential count:—

Polymorphonuclears	..	59	per cent.
Small lymphocytes	..	23	" "
Large lymphocytes	..	17	" "
Eosinophiles	..	1	" "

Both bile salts and bile pigments were present in the urine. There was no trace of albumen. The fæces were clay-coloured.

Laboratory investigations

It must be stated here that the whole work was directed towards attempting to isolate *L. icterohæmorrhagiæ*, based on the probability that the epidemic was leptospiral in nature. The duration of illness of the cases investigated ranged from the day of onset to over three weeks so that any chance of missing the suspected cause (*L. icterohæmorrhagiæ*) was eliminated as far as possible.

Table II gives the details of the cases investigated. It is to be regretted that many more cases could not be examined as the epidemic was on the decline at the time of the visit of the Unit.

The results of laboratory investigation are described under four heads:—

1. Direct examination

(i) *Blood*.—Examination of blood smears stained with Fontana and Leishman stains, as well as dark-ground examinations, were all negative.

(ii) *Urine*.—Dark-ground examination as well as stained smears of the centrifuged deposits were negative.

(iii) *Fæces*.—Stools were examined for cysts of *E. histolytica*. They were all negative.

2. Cultural examination

Rabbit-serum-saline medium was used consisting of serum 1 part and saline 9 parts. The quantities of material used were about 1 c.cm. of blood and 3 c.cm. of urine. The cultures were examined from time to time for a period of over 3 weeks. *L. icterohæmorrhagiæ* was not isolated.

The fæces were also examined for the organisms belonging to the colon-typhoid group. None were isolated.

3. Guinea-pig inoculation

Very young guinea-pigs were used for the purpose. About 3 c.cm. of blood and 5 c.cm. of urine were inoculated intraperitoneally. The animals were kept under observation for a period of over 3 weeks, at the end of which all the animals were found to be perfectly healthy.

4. Adhesion test

For this purpose the Andaman strains of *L. icterohæmorrhagiæ* kindly sent by the Director of the Pasteur Institute, Rangoon, were used.

Equal parts of the patient's serum, leptospira culture, and a bacterial emulsion of *B. coli* were mixed and incubated for 20 minutes and then examined under the dark-ground. No adhesion phenomenon was noticed in any case.

Comments

The definite seasonal prevalence of the epidemic suggests specific infection. Jaundice of an epidemic character is usually associated with leptospiral infection, and the presence among the population of a few persons from the Andamans, where leptospirosis is known to be endemic, led us to the consideration of the epidemic as being one of Weil's disease. The epidemic however started some 5 months after the last arrival from the Andamans. Since none of these gave any history of or showed any symptoms of Weil's disease, the probability of their contributing in any way to the epidemic is very remote. The epidemic had occurred during the driest months of the year. The soil of the place is rocky and dry. There is no natural tank or pond within the precincts, and the whole population is under control. The occupations and the movements of the infected persons were, therefore, not such as to expose them to the risks of a leptospiral infection. The diet was the same throughout the year and had not produced any alimentary disturbances. The water supply, which is common to both the jail and the convent, could not be incriminated, as only a small portion of the population using the same water supply had been infected. The clinical features in all cases were very mild and there was not a single case exhibiting any of the more severe manifestations of Weil's disease such as hæmorrhages, etc. Kumm (1931) has recorded an infection with the paratyphoid group of organisms which occasionally causes an epidemic of jaundice. The clinical symptoms were not suggestive of this infection and the laboratory findings were also negative. The exact nature of the infection thus remains undetermined. The epidemic subsided about the middle of May.

Epidemics having the clinical character noted here have been recorded from time to time, e.g., in West Africa (Beeukwes, Walcott and Kumm), and in various parts of the United Kingdom and the continent. Indeed, it has been suggested that the disease is a virus infection and is spread by the naso-pharyngeal secretions—'droplet' infection (Glover and Wilson). As it is not justifiable to assume the spirochætal nature of such epidemics in the absence of bacteriological or serological evidence, the existence of a distinct type of infectious jaundice of non-spirochætal ætiology has

been suggested by some. The present epidemic supports that hypothesis.

Acknowledgment.—Our thanks are due to the authorities of the Alipuram Jail for all the facilities accorded to this investigation and to the Director, Pasteur Institute, Rangoon, for supplying us with the Andaman strains of *L. icterohæmorrhagicæ*.

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A Mirror of Hospital Practice

SOME SNAKE-BITE CASES

By K. G. GHARPUREY

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SINCE I have been stationed at Ahmednagar, I have come across the following cases of snake bite, six at Ahmednagar itself and two from the district and one from outside, during the last eighteen months. This is not a 'snaky' district, as during the last six years an average of only thirty deaths due to snake bite have been reported annually, in a district with a population of nearly one million and an area of 6,630 square miles.

The following are notes of the cases:—

Case 1.—A woman came to the civil hospital, Ahmednagar, at 5-30 p.m. on 30th April, 1930, with a killed snake that was dried up. This snake had bitten her in the morning at about 6 a.m. on the right forearm about 2 inches above the wrist. The whole forearm was red and swollen as far as the elbow. She had applied 'Oriental Balm' to the arm. There were no after-effects, the swelling gradually going down.

Result:—Recovery.

The snake was a trinket snake—*Coluber helena*—3 feet 6 inches long—non-poisonous.

Case 2.—Case reported in the *Indian Medical Gazette* of March 1931 of a person bitten in Dhulia, West Khandesh, on 27th July, 1930.

Result:—Recovery.

The snake was *Echis carinatus* or Phoorsa—poisonous pitless viper.

Case 3.—A boy, of about 8 years, bitten by a common krait—*Bungarus caeruleus*. Case reported in the *Indian Medical Gazette*, May 1931, p. 266.

Result:—Death.

Case 4.—A man from the city of Ahmednagar came at 10 a.m. on 24th June, 1931, to the civil hospital, Ahmednagar, complaining that when he woke up in the morning he found his face swollen and that he found a small snake near his pillow. His face was slightly red and swollen.

The snake he brought was alive and was a baby *Lycodon aulicus* or the common wolf snake, 8 inches long—non-poisonous.

Result:—Recovery.

Case 5.—A cobra bit one of the hospital staff on 8th July, 1931; the case was reported in the *Indian Medical Gazette* of October 1931.

Snake—*Binocellate Naia tripudians*—poisonous. Antivenene used.

Result:—Recovery.

Case 6.—A boy, of about 7 years, who had just recovered from cholera was found vomiting and unconscious on his bed in the morning at a place named Kolhar Khurd about 36 miles from here on 14th August, 1931. On removing him from his bed a small live snake was found under him. There were many scratches on the boy's back. The boy was seen by Dr. Shiveshwarkar, Assistant Director of Public Health, who was on tour. He brought the killed snake to me. It was a baby common krait—*Bungarus caeruleus*—12 inches long—poisonous.

Result:—The boy died at about 12 noon, the same day.

Case 7.—A snake bit a woman below the ankle in the evening of 20th August, 1931, and she came to the hospital at 8 p.m. with the killed snake.

The snake was *Eryx conicus*—Russell's earth snake—16 inches long—non-poisonous. The bite had no effect on the woman.

Result:—Recovery.

Case 8.—Three live snakes were brought to me at the hospital caught in a grain godown on 8th October, 1931. They were all trinket snakes—*Coluber helena*—non-poisonous. After being let out from a tin in which they were kept, they were identified, captured again and put into the tin. While he was capturing them, one of these bit the catcher on the right index finger on the dorsal surface about $\frac{1}{2}$ inch behind the nail. There were no puncture holes but there were four scratches, two long ones about $\frac{1}{2}$ inch long and $\frac{1}{2}$ inch distant and two small ones on the wrist-side of these two scratches.

The person who was bitten was the same one as in case 5 who was bitten by a cobra before. He was a bit nervous after the bite and complained of slight pain for two hours. Permanganate was applied to the scratches to soothe him. He complained of itching about the eyes, beginning 15 minutes after the bite and lasting for about two hours.

There were no after-effects.

Result:—Recovery.

Case 9.—A snake catcher named Mahaboob Khan lived in a mosque in Bhingar, a suburb within Ahmednagar cantonment limits. He was a reputed snake catcher and used to make money from this job. He came to me on 31st July, 1930, with a big dhaman snake about 8 feet long; he said he had a medicine which he used in cases of snake bite, invariably successfully, and wished me to try it. On talking with him for some time, it was found that he was a practical man of the world and had worked as a stable boy, groom, syce and a rider at the racing stables in Bombay and Poona. I got the impression from his previous history that he lived more by his common sense, wits, and manual dexterity in catching snakes, than by the efficacy of any snake cures. The medicine, he told me, was the powdered fruit of *Michelia champaca* (white variety)—N.O.—Magnoliaceae—given in goats' milk;

Only an occasional tree of this species gives fruit. So the fruit is rare. This Mahaboob was bitten by a snake he caught on 23rd October, 1931, at about 5 p.m. in trying to extract its teeth. He collapsed and became cold, and probably died by 9 p.m. His neighbours came to my bungalow at 12 midnight reporting his condition and said his body was cold. My assistant went there with antivenene at about 1 a.m. but the man had been dead four hours before. The deceased had taken by the mouth his own medicine after having been bitten.

The snake was brought alive to me and it was a full-grown common krait—*Bungarus caeruleus*—poisonous—3 feet 5½ inches long. The punctures on the man were two and were on the dorsal aspect of the left middle finger on either side of the first inter-pharyngeal joint about 1½ inches distant. As the mouth of the krait was not wide enough for the distance between the fangs on the two sides to be over an inch, it is presumed that the man put the bent joint of his left middle finger in the snake's mouth to keep it open and used his right hand to pull out or break the snake's teeth with tweezers.

Result:—Death.

UNUSUAL TYPES OF PRIMARY LESIONS IN YAWS

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and

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THERE can be few diseases displaying such a variety of skin lesions as yaws, some examples of which are described in previous papers by us (Dey, 1930 and FitzGerald and Dey, 1931), but the primary lesion, when discovered, is remarkably constant. It seems therefore of interest to record two types, which, whilst they have been previously described, are undoubtedly of great clinical rarity.

I. *Gumma-like primary lesion*.—A Lalung woman, aged 20, came to one of our yaws centres, presenting a sore on the ulnar border of the forearm. She gave a history of about one month's duration (though this cannot be relied on) and as far as could be ascertained the sore had started as a papule which had rapidly broken down. In appearance it was indistinguishable from a gumma, being an indolent punched-out circular sore about ¾ inch in diameter, but not indurated nor adherent to the underlying bone. There was slight lymphatic involvement, but no pain. No other lesions suggesting yaws were present. The village from which she came was heavily infected. The serum gave a positive Sachs-Georgi test and treponemata were recovered in large numbers from the sore.

Syphilis could be definitely excluded; it is in any case unknown amongst the Lalungs. After three weekly injections of Halarzol, totalling 12 c.cm., the lesion was cured. Primary lesions of this nature are recorded by Manson-Bahr.

II. *Massive fungoid lesions*.—This type of primary lesion though somewhat commoner than the above is yet sufficiently unusual. We have seen two only in a series of cases running now to nearly 700. (It is however fair to state that, as treatment was only recently instituted, many of these were of long standing. Of primaries and very early secondaries, we have seen

29; the incidence of this type is therefore possibly considerably higher.) The lesion, starting as a papule, rapidly enlarges, forming a heaped-up yellow crust, beneath which is a mass of exuberant granulations with a copious serous secretion. In the case illustrated the lesion had appeared in this form two months previously and, at the time of photographing, secondaries were just appearing.

It is noteworthy that both these cases presented the primary lesions on the foot or ankle, and it seems not unreasonable to assume that



Fungoid primary lesion in yaws.

secondary infection is responsible for this atypical development.

Bearing in mind the foul personal habits of the typical yaws sufferer, one is indeed tempted to the conclusion that the enormous extent of the late secondary and tertiary lesions may be perhaps due to the symbiosis of the *Treponema pertenue* and some other organism. Certainly the immunity from yaws of adjacent peoples who have some regard for hygiene is a remarkable and well-established fact.

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A NEW EYELID CLAMP

By M. M. CRUICKSHANK

MAJOR, I.M.S.

Government Hospital, Madura

I DEvised this clamp to enable me to evert the upper eyelid when performing Webster's

operation for entropion. The three bars bearing teeth are not in a straight line, the centre one being slightly shorter, so that when they are placed beneath the lid, the plate of the clamp being on top, they lie just within the ciliary margin and along the natural curve of the lid.

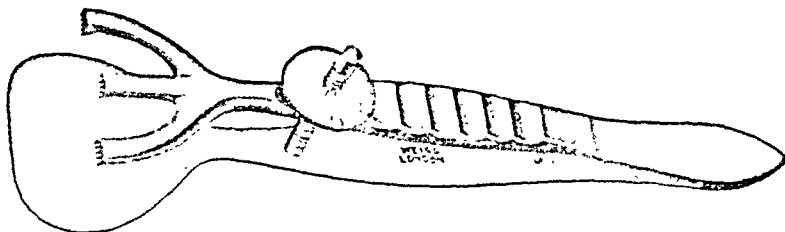
The clamp, placed in position, is screwed up and the handle brought over the eyebrow. In

Treatment.—The following prescription was given:—

R Helmitol grs. v
Acidi borici grs. x
Spiritus chloroformi m x
Infusi buchu ad oz. i

To be taken three times daily

The bladder was washed out with an astringent lotion. Slight amelioration of his symptoms occurred. During this time the patient also complained of pain in his



this way the lid is everted and spread out flat from canthus to canthus.

Though specially devised for Webster's operation, I have found it useful also in performing tarsiectomies.

The clamp is manufactured by Messrs. John Weiss & Sons, Oxford Street, London.

NEOSTIBOSAN IN CHYLURIA*

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A PATIENT, M. A., resident of Fatehpur, Allahabad, about 35 years of age, attended the out-patient department of the Prince of Wales' Hospital on September 11th, 1931. He was admitted to the medical ward by the State Surgeon. On admission he gave the following history:—

In 1919 one morning he noticed that his urine was milky in colour. A day after he observed blood as well.

He showed himself to the Civil Surgeon at Fatehpur and was diagnosed as a case of chyluria. He then showed himself to several other doctors and various treatments were suggested to him. At the time the urine became somewhat clearer and the improvement was maintained for a few days, but later the condition relapsed. Another period of improvement followed, but in July of 1931 an enormous quantity of blood and milky material began to come out at each micturition. The patient grew weaker and very anæmic.

The patient then went to several hakeems who were of opinion that there was pus and blood in his urine, and treated him without result.

On September 13th, 1931, his urine was examined by the pathologist at the State hospital:—

Naked-eye appearance.—The fresh urine was milky in appearance and streaked with blood; on standing, clotted blood and a white coagulum were noted (also see table).

Microscopical examination.—Red blood corpuscles, epithelium, nucleated granular cells, and fatty material were present. On teasing out a piece of the coagulum over a slide microfilariæ were detected.

scrotum (filarial orchitis); for this belladonna ointment locally and a scrotal support were advised.

On September 19th, 1931, I injected Neostibosan, $\frac{3}{4}$ grain, intramuscularly; the urine became clear that day, but it assumed its usual appearance the next day. A second injection ($1\frac{1}{2}$ grains) was given on September 23rd, but no abatement in his symptoms occurred. The third injection of $3\frac{1}{2}$ grains was given on September 27th, and again the urine cleared completely.

From then onwards the patient began to show improvement in health, and for his anæmia I gave 6 injections of iron arsenite, twice weekly. He was discharged from the hospital, but he continued coming up regularly as an out-door patient to complete his full course of 10 injections of Neostibosan. Further injections I gave thus:—4th injection of $4\frac{1}{2}$ grains, 5th of 5 grains, and the remaining five injections of 5 grains twice a week.

To-day, October 26th, he intends to leave for home; he has been advised that he should have another course if there is any indication of reappearance of the symptoms. It remains to be seen whether the cure will be permanent.

TABLE

Urine examination before, during and after treatment

	Before treatment, i.e., on 13-9-31	During treatment, i.e., on 1-10-31	After treatment, i.e., on 26-10-31
Reaction ..	Acid	Acid	Acid
Specific gravity ..	1.010	..	1.015
Sugar ..	Nil	Nil	Nil
Albumin ..	Present	Nil	Nil
Bile ..	..	Traces	Nil
Deposit ..	Red blood cells, fat, and epithelial cells.	Nil	Nil

Note.—In a paper which appeared in the *Indian Medical Gazette* of March 1929, Chopra and Rao reported their experience with a number of antimony, arsenic, and other compounds, including Neostibosan. They found that none of these compounds had any effect

* Rearranged by the EDITOR, I. M. G.

on the number of microfilariae in the peripheral blood, though a few did produce an improvement in cases of chyluria. The latter of these two workers tells us that he has been continuing this work, and is now preparing a paper for publication. He can confirm this observation regarding the improvement in the chyluric condition after the administration of Neostibosan.—EDITOR, I. M. G.

MICROFILARIAE IN THE SPUTUM*

By P. K. GHOSH, M.B., D.T.M.

Clinical Pathologist, Medical College, Calcutta

MICROFILARIAE in the sputum is a rare finding. So far as I know, there is no mention of it in recent literature.

Prior to examining the sputum of lung cases for acid-fast bacilli by the ordinary Ziehl-Neelsen's method, I usually examine the unstained specimens under the 1/6th objective. Recently I came upon two definite cases of microfilariae in association with hæmoptysis sputum, and in another case I found only the microfilarial sheath in the sputum, but I could not confirm my diagnosis as the patient in question never turned up for further examinations.

Case 1.—E. D. M., an Anglo-Indian boy, aged 25, who had been suffering from hæmoptysis for 1 month. He had cough, fever, wasting and dyspnoea. One of his brothers had died of pulmonary tuberculosis in 1922. He had scattered râles over both lungs—x-rays showed infiltration on both sides. He brought the sputum for examination on 17th August, 1931; it looked like fresh red blood. A cover-slip preparation under the 1/6th objective revealed a microfilaria; another preparation was examined, and it also contained microfilariae. The slide stained by Ziehl-Neelsen's method showed many clear-cut microfilariae within their sheaths and also a fair number of acid-fast bacilli.

Blood examination on 19th August, 1931. Total white blood cells—7,500, polymorphonuclears—53 per cent., lymphocytes—25 per cent., large mononuclears—2 per cent., eosinophiles—20 per cent.

The day-time blood from a vein, on centrifugalisation after defibrinating with distilled water, showed very scanty sediment. The patient is at present in the Presidency General Hospital for his chest complaint.

Case 2.—D. B., Hindu male, aged 35, working as a mistri in the Oriental Gas Co., Ltd., and living in Taltollah, Calcutta. He had hæmoptysis for four days and was very nervous. He brought the blood-stained sputum on the third day of hæmoptysis. Under the 1/6th objective it showed pus cells and red blood cells. A microfilaria was present—but here it was lying separated from its sheath, and was not moving. He had a cough and hæmoptysis, but no fever and no other signs of tuberculosis. He gave a history of influenza one month back from which he recovered quickly. He had syphilis 20 years ago. X-rays showed slight infiltration in one lung only. No acid-fast bacilli were found in the lung on two examinations.

Blood examination on 27th August, 1931.

Blood taken at night from finger—microfilariae present in large number.

Blood count—total white blood cells—6,000; polymorphonuclears—70 per cent., lymphocytes—21 per cent., large mononuclears—0 per cent., eosinophiles—9 per cent.

Wassermann reaction—strongly positive.

Case 3.—The patient had hæmoptysis. Under the 1/6th objective I found a filarial sheath, but no microfilariae. No acid-fast bacilli were found. The patient never turned up again so that a confirmatory examination of his night blood could not be carried out.

It is interesting to note that both these men were absolutely free from filarial symptoms; they gave no history of periodic fever, nor of lymphatic swelling.

The embryos of *Filaria bancrofti* are found in the peripheral circulation during night-time. Manson has shown that they reside in the lungs and kidneys chiefly during the day. The sputum of the patients brought were those of the early morning, where the microfilariae are receding from the peripheral circulation to the internal organs. The microfilaria normally resides in the lung capillaries and its presence in the sputum indicates that it has burst through the capillary wall into an alveolus. The presence of microfilariae in the sputum in cases of tuberculosis of the lung can be easily explained this way, but whether the microfilaria itself can pierce the alveolar wall and thereby cause irritation, cough and hæmoptysis, it is difficult to say. It is however of interest that in our second case there were practically no signs of tuberculosis of the lungs yet there was hæmoptysis and microfilariae in the sputum.

My thanks are due to Dr. Mukerji and Dr. Ukil of the chest department, Dr. M. N. De, Resident Physician, and Lt.-Col. D. P. Goil, I.M.S., Principal, Medical College Hospitals, for kindly allowing me to publish the above notes.

(*Note.*—A similar case, in which the patient also suffered from hæmoptysis and in which microfilariae were found both in the sputum and in the blood, was reported on page 165 of the *Indian Medical Gazette* of April 1923.—EDITOR, I. M. G.)

A CASE OF STONE IN THE BLADDER PRESENTING A PECULIAR SYMPTOM-COMPLEX

By B. B. BHATIA, M.D., M.R.C.P. (Lond.)

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King George's Hospital, Lucknow

THE following case is in my opinion of sufficient interest to merit notice.

A young Punjabi Sikh, aged 22, came to my medical out-patients on the 9th October, 1931, complaining of periodic attacks of dysentery for the last two years; for this he said he had been under the treatment of several qualified doctors and had taken two courses of emetine injections, a course of kurchi and bismuth iodide, and any amount of the usual anti-dysentery mixtures. In spite of all this the attacks consisting of pain in the lower part of the abdomen, tenesmus, frequency of defæcation (40–50 times in 24 hours), prolapse of the rectum, and marked diminution in the quantity of urine, had recurred regularly every second or third week. All these symptoms usually lasted from 3 to 7 days, and then there was a sudden and complete relief. I was greatly struck by the peculiar train of symptoms which this man described and which I had not met with before in cases of chronic dysentery. So I made some further enquiries from the patient and found

* Rearranged by the Editor, I. M. G.

that with the diminution in the quantity of urine there was also some dysuria, and that the relief from the symptoms came chiefly at night time and was preceded by passage of a large quantity of urine. The stools consisted mainly of mucus.

The first attack started with pain in the lower part of the abdomen for which he took a dose of magnesium sulphate; from the next morning all the above symptoms made their appearance and have since been recurring regularly. I thought of the possibility of a stone in the bladder which periodically came forward, obstructed the internal opening of the urethra causing severe straining during micturition, and resulted in prolapse of the rectum, tenesmus and discharge of mucus. As the patient was in the interval of the attacks, I was able to do a rectal examination; I felt by the bimanual method a mass as big as a walnut, projecting into the anterior wall of the rectum. The case was shown the same evening at a meeting of the Old Boys' Association of the King George's Medical College, where after a good deal of discussion the case was left *sub judice*. Suggestions of diverticulitis, prostatic stone and hydro-nephrosis were made. The patient was admitted to the surgical wards on the 30th October, 1931, and operated on supra-pubically on the 2nd November, 1931, when a stone—consisting mostly of oxalates—of the size and shape of a walnut and weighing 23 grammes, was found lying freely in the bladder cavity. The patient made a complete recovery from this operation in 10 days and since then has had no recurrence of his symptoms.

The interest of this case lies in the fact that, though a large rough stone was ultimately found in the bladder, the patient only complained of symptoms pertaining to the bowel and not to the bladder; this accounted for the fact that the diagnosis was missed for over two years. The regular periodicity, the absence of hæmaturia, and of any referred pain down the urethra, were all in my opinion very unusual for bladder calculi. Besides this, the shape of the stone was not such as could effectively obstruct the opening of the urethra.

I wish to express my thanks to Mr. R. N. Bhatia, Professor of Surgery and Superintendent, King George's Hospital, under whose care the patient was, for permission to publish these notes.

A CASE OF RUPTURE OF THE URETHRA

By T. SESHACHALAM, L.M.&S., M.R.C.S. (Eng.)
L.R.C.P. (Lond.)

Resident Medical Officer, Krishnarajendra Hospital
Mysore

THE following case which is interesting on account of the unusual findings during the operation is perhaps worth recording.

A male labourer, aged 45, was brought to the hospital for retention of urine and swelling of the perineum and scrotum after a fall astride the branch of a tree twenty-four hours previously. There was a history of a moderate amount of bleeding from the urethra for the first few hours. Though there was great desire to pass urine he was unable to do so. On examination, the bladder was found distended up to the umbilicus, and the perineum, the scrotum, and the penis were swollen, oedematous, and tender.

Diagnosing the case as one of extravasation of urine after rupture of the urethra, spinal anaesthesia was given and a perineal section was made. A dark firm clot irregularly oval in shape was found to be lying vertically in the superficial pouch of the perineum. On removal of this clot, the ends of which were tapering, it was found that the urethra had been completely severed and the two ends retracted, leaving a space 3 inches long which was occupied by the firm clot. The distal end was easily found but the proximal end only with difficulty. Both the ends were mobilised and a repair was done, suturing the roof first, threading a rubber catheter, and then suturing the sides and floor. Multiple incisions were then made along the lines of safety in the scrotum and penis.

A very curious feature noted during the operation was that the tissues incised looked clean and exuded clear serous fluid, and did not show the dark gangrenous tissue, exuding foul-smelling fluid and gas, which is so characteristic of ammoniacal decomposition in cellular tissue, with which every surgeon dealing with emergent cases of this nature is familiar. Convalescence was not eventless as the patient pulled out the catheter on the third day. He was discharged cured 32 days after operation.

The interesting points in this case are that there was complete rupture of the urethra, which is rare, and that the bleeding which was mostly into the superficial pouch clotted and blocked the ends of the ruptured urethra, preventing external hæmorrhage and extravasation of urine.

A CASE OF RECURRENT APPENDICITIS WITH A LARGE FÆCAL CONCRETION

By S. M. UJWAL, L.M.P.

Officer in charge, Radiological Department, Hewson
Hospital, Jodhpur

M. L., AGED 30 years, male, a Brahmin clerk, was admitted on September 22nd, 1931.

History.—Ten years ago the patient had an attack of vague abdominal pain lasting two or three days. For four years these attacks recurred every eight or ten days, sometimes being accompanied by constipation and sometimes by diarrhoea (4 or 5 motions daily). He describes the pain as being of a griping character, but remembers nothing else about it. He had no other symptoms during those years. Six years ago he had a more severe attack lasting 15 days. He was then free until four years ago when he had another severe attack; the pain was localised in the umbilical region and was accompanied by vomiting, rigidity of the abdomen, and constipation. The latter was relieved by a purgative on the second day, when the patient also passed urine which he had been unable to do on the first day. Vomiting ceased after 4 days, but the pain remained for 10 days. After that he had only two slight attacks, until five months ago when he had an attack of very severe pain, which lasted for a month. The pain became settled in the right iliac fossa and he had great difficulty in getting his bowels open. There was no vomiting. Since then he has had continuous right-sided pain, associated with the passage of much flatus. He has become steadily weaker.

On examination.—He appeared fairly healthy, with no marked loss of weight; all other organs and the urine were normal. Locally, the abdomen moved well on respiration. No hyperæsthesia or rigidity was detected. There was deep tenderness in the right iliac fossa, and a movable hard lump the size of a lemon was felt. The psoas test and a rectal examination were negative.

Test meal.—Free hydrochloric acid—0.05 per cent., total acidity—38.

Radiographic examination after barium meal.—Nothing abnormal was detected in the emptying of the stomach, or anywhere in the intestinal tract, except that the cæcum appeared to be hypertonic. The appendix was not detected.

On all the plates a shadow about the size of an anna piece was, however, present in the right iliac fossa, but was never seen twice in exactly the same place. It was as dense as that of a kidney or vesicular stone.

Diagnosis.—Probably recurrent appendicitis, with either a stone in some part of intestinal tract in the right iliac fossa, or a calcified gland. The radiologist thought the stone might be in the appendix, but the surgeon thought it was too large.

Operation on 29th October, 1931.—Under general anaesthesia, through a right lower paramedian incision, the rectus being retracted laterally, the abdomen was explored. Nothing abnormal (no calcified gland) was found, except the appendix which was freely movable and lay curled up in a solid mass fixed on the medial side of the cæcum with the great omentum drawn all round it and at one place actually adherent to the transverse colon. Appendicectomy was performed and the abdomen closed. Recovery was uninterrupted except for an attack of malaria. He was discharged on October 10th.

Pathological report.—The appendix showed two distinct parts, the distal end being normal except for a little catarrhal inflammation and external adhesions.

The proximal end was saccular and contained one irregularly-oval stone whose size was 1.8 cm. by 1.3 cm. by 0.9 cm. and weight 1.7 grammes. It was, on section, seen to be laminated exactly like a bladder stone, but was certainly a faecal concretion. There was no foreign body present as its nucleus.

I am grateful to Mr. E. W. Hayward, F.R.C.S.E., Principal Medical Officer, Jodhpur, who performed the operation, for kindly giving me facilities for the preparation and publication of these notes.

REACTIONS FOLLOWING HYDNO-CREOL INJECTIONS*

By S. S. PATTANAYAK, L.M.F.

Medical Officer in-charge, Leprosy Clinics, Pipli (District Puri)

THE following incident occurred in connection with the treatment of a leper.

Some time ago a leper was undergoing his usual course of treatment in this clinic. On that day he was getting the maximum dose, i.e., 8 c.cm. of hydno-creol by the usual infiltration method, hardly had 2 c.cm. of the oil entered, when the patient coughed and sneezed violently—the attack simulated an asthmatic fit, and was followed by profuse perspiring and a tendency to collapse. Immediately he was removed to bed. The fits continued for some time, when I felt the pulse gradually sinking. At once a dose of stimulant mixture was administered, I dabbed his face with cold water, and he was fanned.

To combat the collapse, which was threatening, an injection of strychnine and digitalin was given. After half an hour he was gradually brought round, but could hardly speak. The coughing, which was incessant, was the chief feature. The patient denies any history of asthma—nor had he any such trouble before. He had

been attending the clinic for about a year and had had a number of such injections. Since this occurrence he has not attended the clinic—obviously apprehending a re-occurrence of the fits.

Note.—We submitted this note to Dr. E. Muir of the Leprosy Department, Calcutta School of Tropical Medicine, who commented as follows:—

This is an occasional occurrence which can, however, be avoided by carefully following the correct technique. Obviously this condition was caused by some of the oil being injected into a vein and being carried to the lung as an embolus. When intramuscular injections of oil are made it is well to pull upon the piston after introducing the needle, so that if the point has entered a vein blood will be drawn into the barrel of the syringe. If no blood appears, the piston may safely be pushed home.

—EDITOR, I. M. G.

CASES OF TICK-TYPHUS IN A TOWN*

By D. M. MUKERJI, L.M.S.

Assistant Surgeon, Bengal Nagpur Railway, Nagpur

SINCE the description of tick-typhus by Major-General (then Major) J. W. D. Megaw, in 1917, cases have been reported from various parts of India mostly contracted in jungles, but seldom in a town. Moreover in very few cases could a previous tick bite be established, although the tick is supposed to be the infecting agent. The following cases are of interest as they both occurred in a big town (Nagpur), and also because in one case a tick was found on the body 17 days prior to the onset of the fever.

A. G. B., aged 34, a signaller of the Telegraph Department, Nagpur, had fever on 7th October, 1931. He had regular ague like that of malarious fever for the first two or three days and was given cinchona and quinine. The rash appeared on the 4th day, but was not very profuse at first. It was rose red at the beginning but did not disappear on pressure, and was somewhat shotty though not to the same extent as in small-pox. A provisional diagnosis of dengue was made, but as the rash continued to appear in crops and as the fever persisted even after the 10th day the diagnosis of tick-typhus was arrived at. On the 10th day the blood was examined for the Widal and Weil-Felix reactions; both proved negative. The patient gave a history that on the 20th September last, i.e., 17 days previous to the onset of the fever, he discovered a tick on his arm and dislodged it. The actual day of the discovery of the tick has been arrived at from the fact that the patient discovered it on the day following the one he occupied a particular room in his house which had previously been kept locked up as a lumber room. The patient said that the tick was like a dog tick, but he did not feel any sting or irritation at the place where the tick lodged. The patient had never been out of Nagpur for months before getting the fever, but was residing in a place which was overgrown with grass and vegetation. The important symptoms were sleeplessness, a dazed appearance, somewhat severe conjunctivitis, and severe headache in the first week. The rash left behind the deep purplish-brown marks, so characteristic of tick-typhus. Fever lasted 3 weeks (a temperature chart is

* Rearranged by the Editor.

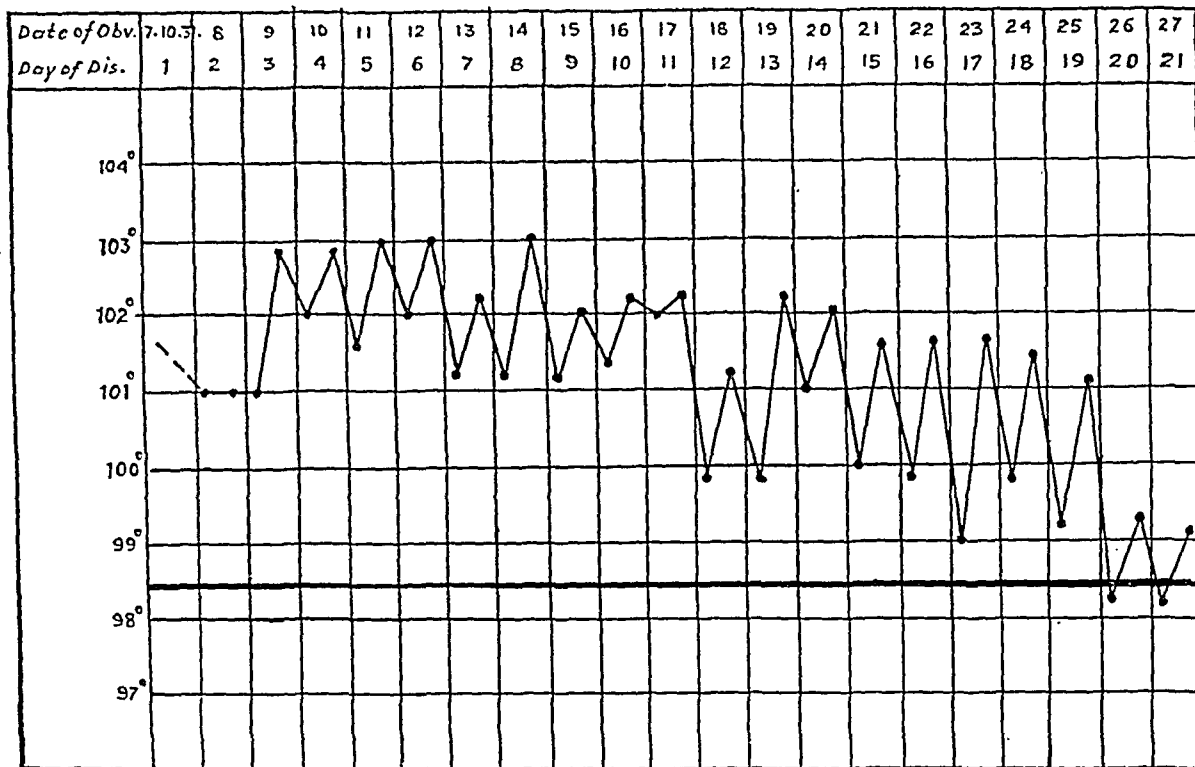
* Rearranged by the Editor.

shown). Leucocytosis was another feature. The blood count showed:—

Polymorphonuclears—80 per cent., large mononuclears—11 per cent., lymphocytes—8 per cent., eosinophiles—1 per cent.

The writer saw yet another case at Nagpur in November 1928, but in this case the infection was contracted in the jungles of Bhandara district where the patient, an assistant in the

Name. *A. G. Bush.* Age, 34. Disease. *Tick-Typhus*



There was slight albuminuria throughout. When the fever went down after three weeks, there were severe fits of profuse perspiration several times during the day. This symptom was not observed in other patients seen by the writer. This case was seen by Colonel W. Tarr, Civil Surgeon of Nagpur, on the 14th day of disease and he confirmed the diagnosis.

Two other cases came under the treatment of the writer, one in October 1926 and the other in November 1930. In neither case had the patients ever left Nagpur for some time before the onset of fever, and they were both residing in the congested parts of the town. In the first case the patient, Babu S. N., a government pensioner living in Khalasi Lines, Nagpur, had fever of 3 weeks' duration, injected eyes, a characteristic rash and an even more characteristic after-discoloration of the skin. The clinical picture was complete but the diagnosis was not established beyond doubt by the negative Widal and Weil-Felix reactions. In the second case, the patient was the young son, aged about 5 years, of a professor in the Science College, Nagpur. In this case the diagnosis was made on the 8th day from the characteristic symptoms, especially the colour of the rash. The writer was so sure of the diagnosis and the comparative harmlessness of the disease that he did not think it worth while to have the Widal and Weil-Felix reactions done.

geological department, was doing survey work. This patient was also seen by Colonel W. Tarr, Civil Surgeon, Nagpur. The diagnosis was beyond doubt as both the Widal and Weil-Felix reactions were negative. Unfortunately, the writer did not preserve the temperature chart and other particulars of the case.

SEVERE REACTION FOLLOWING THE INJECTION OF UREA-STIBAMINE*

By MANINDRANATH BOSE, L.M.F.

Medical Officer, Rajgunge Charitable Dispensary
Howrah

A PATIENT, S., aged 14, attended the Rajgunge Churamoni Paul's Charitable Dispensary for the treatment of kala-azar which was diagnosed by the aldehyde test. He received two injections of urea-stibamine, 0.05 gm., weekly, without untoward symptoms being noticed; on the day of the third injection, 0.1 gm. of urea-stibamine was injected. The patient did not feel any uneasiness at the time of injection, but after two or three minutes he complained of a burning sensation all over his body and his face and lips became swollen and congested, and his eyelids puffy. He showed signs of suffocation, and froth came out from his mouth. The pulse was almost imperceptible and I at once gave him an injection of solution of adrenalin chloride. After 15 minutes

* Rearranged by the Editor.

the pulse was perceptible and the patient passed a stool in the bed after which he became slightly better, though he still complained of a burning sensation and tightness in the chest. After three or four hours the untoward signs and symptoms gradually disappeared.

I am greatly indebted to the Civil Surgeon, Howrah, who suggested that I should give small doses at long intervals. At first I tried 0.05 gm. but the same symptoms appeared.

I am anxious to know if such reactions are due to impurities in the drug or sensitiveness of the patient, and what line of treatment ought to be followed.

Note.—Such reactions are by no means uncommon with a certain group of antimony compounds of which urea-stibamine is one. We refer our contributor and readers who are interested in the subject to an article in the *Indian Medical Gazette* of November 1926.

The reactions are not necessarily due to impurities in the compound, but to sensitiveness of the patient to the particular compound. Desensitization may be brought about by giving very small doses at the usual intervals, but such doses must be much smaller than Dr. Bose used; a dose of 0.01 gm. may be tried first of all. However, the better plan is to change the treatment and give some other antimony compound, taking care to commence with very small doses.—EDITOR, I. M. G.

Special Article

INDIAN IPECACUANHA

By R. N. CHOPRA, M.A., M.D. (Cantab.)

LIEUTENANT-COLONEL, I.M.S.

and

B. MUKHERJEE, M.B. (Cal.).

(From the Department of Pharmacology, School of Tropical Medicine, Calcutta)

I. R. F. A. Indigenous Drugs Series No. 30.

IPECACUANHA is a well-known drug and has been used for a long time in medicine for its emetic and expectorant properties. It is obtained from *Psychotria ipecacuanha*, Stokes, a small plant indigenous to Brazil. The plant grows in small clumps (about 30 cm. in height) and produces numerous fibrous roots, many of which thicken and become filled with starch. These moniliform roots constitute the drug of commerce and are extensively exported from Rio de Janeiro to different parts of the world. Besides the Rio ipecacuanha, several other varieties can be met with in the drug markets. Minas ipecacuanha is derived from the same plant, (*Psychotria ipecacuanha*) cultivated in the province of Minas Geraes in Brazil. This variety closely resembles the Rio variety and contains about the same proportions of the total alkaloids. East-Indian ipecacuanha is rather larger than the Brazilian drug. It is obtained

from the same plant (*P. ipecacuanha*) cultivated in Johore and Selangor in the Federated Malay States. Gartagena ipecacuanha is derived from an unidentified species of *Psychotria* in Columbia. The roots are distinguished from all the other varieties by their rather larger size, darker colour and by the annulations which are less marked than the Rio variety. This variety is not official in the British Pharmacopœia but is recognised by the United States Pharmacopœia.

Indian substitutes of ipecacuanha

Ipecacuanha is not indigenous to India and this country has to depend on foreign countries for the supply of the drug. As the demand is very great, attempts have been made from time to time by botanists and clinicians to find suitable substitutes for the drug in India. *Naregamia alata* (Goanese ipecacuanha) N. O. *Meliaceæ*; vern. Mar.—*Tinpani*, *Pittvel*, is a small glabrous, under-shrub with trifoliate leaves found in western and southern India and has been said to possess properties akin to ipecacuanha. It was tried in Madras in acute dysentery and also as an emetic and expectorant with indefinite results. It contains an alkaloid called *naregamine* which is not related in any way to emetine. *Tylophora asthamatica* (N.O. *Asclepiadææ*): Vern.—Hind.—*Jangli-pikvan*; Beng.—*Antamul*, Tam.—*Naypalai*, is another plant which is still used as a substitute and some believe with satisfactory results. It is a small twining plant, common in the forests throughout eastern India, Bengal, Assam, Cachar, Chittagong, the Deccan and Burma. It was first brought to the notice of the practitioners of western medicine by Roxburgh many years ago. O'Shaughnessy confirmed Roxburgh's opinion and said that the emetic properties of the roots are well established and that it affords an excellent substitute for ipecacuanha. The properties of this plant so convinced the early workers that it was admitted as official in the Bengal Pharmacopœia of 1844. On the compilation of the Pharmacopœia of India in 1868, the leaves were made official in preference to the root as they produced more uniform and certain results. *Asclepias curassavica* is still another plant which was introduced into India from the West Indies and has become completely naturalised to India. It now grows wild in many parts of south India and in Bengal. The root of this plant possesses emetic properties and hence the West-Indian colonists gave to it the name of 'bastard or wild ipecacuanha'. The active principle, however, is a glucoside asclepine and not the alkaloid emetine. Besides these there are several other herbs in the indigenous system which have been claimed as substitutes for ipecacuanha, e.g.,—*Anodendron paniculata*, *Calotropis gigantea*, *Gillenia stipulaceæ*, *Euphorbia ipecacuanha*, *Bærhaavia decumbens*, *Sarcostema*

glabra, etc. Though detailed chemical and pharmacological studies of these drugs have not been made, it has been shown that none of them contain emetine or its allied alkaloids, but in most cases they contain irritant substances which are responsible for their emetic properties. Some of these remedies have been actually tried in the treatment of amœbic dysentery, but without success.

Cultivation of ipecac in India.—As far back as 1866, Dr. King realised the importance of ipecacuanha cultivation in India and introduced the plant in some of the experimental nurseries in Bengal and the Nilgiris. The cultivation was at first attended with very little success, owing to the slowness of propagation peculiar to the plant and to climatic causes. The interest of the authorities in this direction, therefore, distinctly diminished. It was not until 1886, when the superintendent of the forest department in the Straits Settlements found that ipecacuanha flourished in the local plantations quite as well as in its native habitat in Brazil, that its cultivation was taken up again with certain amount of zeal. Even then the attempts were not markedly successful. Excessive daily fluctuations of temperature seem to affect the plantations badly and, unless very elaborate arrangements are made to counteract them, there is a chance of the whole stock degenerating. The Nilgiri plantations had to be closed down at the beginning of this century. The plantation at Mungpoo in the Darjeeling district had to be shifted to a higher level to save the plants from premature death. In the new area the plants were found to do well and there appeared to be a good prospect of the cultivation proving a success. In the report of the Bengal cinchona plantations for the year 1921-22, a distinctly optimistic note as to the future of ipecacuanha culture in India is struck for the first time. The report shows that it is possible to rear successfully young plants from the seeds produced from the old stocks, and this is actually being done in the Bengal cinchona plantations. Henceforth, through the unceasing attempts of the plantation authorities, ipecacuanha culture in Bengal has made a great headway. The existing nurseries have gradually been extended and the

present position of cultivation can be estimated from the fact that nearly 226,496 plants are now grown in Mungpoo alone. Recently, plantations have also been started in the Mergai district of Burma in the cinchona plantations under the Central Government. This plantation has met with very great success. Nearly 68,852 plants have already been reared. Judging from the rate of its growth the Burma plantation is likely to be profitable, and in the near future may come to be a very useful source of Indian ipecacuanha.

Chemical composition.—The chief constituents of ipecacuanha root are the three alkaloids, emetine, cephaline, and psychotrine and the organic acid, ipecacuanhic acid; methylpsychotrine and emetamine are also present in small proportions. The root contains in addition much starch. The total alkaloids present vary in good samples of the root from 2 to 3 per cent. (the B. P. standard being not less than 2 per cent.). Of this total alkaloidal content, about 72 per cent. is emetine, and about 26 per cent. cephaline, while psychotrine forms only 2 per cent. The United States Pharmacopœia demands that ipecacuanha should contain not less than 1.75 per cent. of the ether-soluble alkaloids of ipecacuanha. Cartagena ipecacuanha contains approximately the same quantity of total alkaloids of which, however, only 40 per cent. is emetine and 57 per cent. cephaline. Because of these differences, the physiological activity differs from that of the root of *Psychotria ipecacuanha* and the drug is, therefore, excluded from official use. The Brussels Conference agreed that powdered ipecacuanha should have an alkaloidal strength of at least 2 per cent.

Analysis of Indian ipecacuanha

Paul and Cownley (1902) analysed the Indian ipecacuanha and their results show that the Indian-cultivated variety approaches the standard of the British Pharmacopœia very closely. The Brazilian root, the Columbian root and the Indian root all contain about 2 to 2.5 per cent. of total alkaloids. Detailed analyses of the alkaloidal contents of the different roots are given in the following table:—

	INDIAN IPECAC		RIO IPECAC		COLUMBIAN IPECAC	
	Root		Root	Stem	Root (two kinds)	
Emetine ..	1.39		1.45	1.18	0.89	0.83
Cephaline ..	0.50		0.54	0.59	1.26	0.97
Psychotrine ..	0.09		0.02	0.03	0.05	0.18
TOTAL ..	1.98		2.01	1.80	2.20	1.98

Expressed in a percentage form, the relative proportion of each alkaloid is as follows:—

important causes of morbidity in the British and the Indian Army, and in the jail population

	INDIAN IPECAC		RIO IPECAC		COLUMBIAN IPECAC	
	Root		Root	Stem	Root (two kinds)	
Emetine ..	70.20		72.14	65.60	40.5	44.95
Cephæline ...	25.26		25.87	32.80	56.8	47.98
Psychotrine ..	4.54		1.99	1.60	2.7	7.07
TOTAL ..	100		100	100	100	100

A perusal of the above table will show that the emetine content of the Indian root compares favourably with the Brazilian root, though the total alkaloids are not so high. For pharmaceutical preparations, where the emetine content forms the basis of standardisation, the Indian ipecacuanha appears to be of equal value to the Brazilian variety. The Columbian root is very rich in total alkaloids, but the proportion of emetine is very small for commercial purposes.

Recently, owing to improved methods of cultivation, it is reported that the emetine content of the Indian ipecacuanha has markedly improved. An estimation carried out under the auspices of the Botanical Survey of India in 1922-23 showed that the Indian ipecacuanha (Mungpoo) had a total alkaloidal content of 2.1 per cent. of which nearly 1.2 to 1.3 per cent. was emetine. This is indeed a very satisfactory figure. The ipecacuanha derived from the Burma plantation is expected to be a still better product with a higher emetine content.

Indian emetine.—A quantity of emetine extracted from the Indian ipecacuanha cultivated at Mungpoo was obtained from the Director, Botanical Survey of India, and was tested in the Calcutta School of Tropical Medicine, both chemically and biologically, to determine whether the product came up to the standard prescribed. The Indian emetine was found to possess practically the same physical and chemical characteristics as a standard sample of emetine obtained from a reliable firm in Germany. The melting point was also found to be identical. A solution of the alkaloid was injected into experimental animals under anaesthesia but no abnormal symptoms indicative of toxicity could be observed. The Indian emetine was also tried in definitely-proved cases of amœbic dysentery in the Carmichael Hospital for Tropical Diseases and gave very satisfactory results.

Economic aspects.—Ipecacuanha is a drug of very great importance to India and is largely employed as an expectorant in the treatment of inflammatory conditions of the respiratory passages. Its use as an emetic is no less important, although in recent years it has been replaced by apomorphine. As a source of emetine, its usefulness cannot be over-estimated, in view of the very wide prevalence of amœbic dysentery in this country. According to Acton and Knowles (1928) dysentery is one of the

in India. The admission rate, which is 40.6 per mille for the British Army, rises to 46.5 per mille for the Indian Army, and in jails accounts for the very high admission rate of 83.3 per mille. It is very difficult to find the average incidence of dysentery amongst the civilian population in India. An analysis of a large number of stools examined in the protozoological department, Calcutta School of Tropical Medicine, however, showed a general incidence of 14 per cent. amongst the population seeking relief from the out-patient department; the large demand for the drug can thus be easily appreciated. Though India has a cheap anti-dysenteric remedy in *Holarrhena antidysenterica* (Kurchi), the curative effects of the latter drug are at present not well established and the demand for emetine is likely to be large for many years to come. As the drug is not grown in India, large quantities of crude ipecacuanha root and also emetine are imported every year. If the drug is grown in India and the alkaloid extracted locally, this demand could be met by internal resources. A good quality of ipecacuanha root grows in India in the cinchona plantations at Mungpoo in Bengal and at Mergui in Burma. Though at present the quantity produced is not commensurate with the demand, it is expected that with a little more attention the yield could be considerably increased in the near future. The example of ipecacuanha cultivation in the Federated Malay States, where the plant was introduced only about 30 years ago and is now one of the chief sources of supply of the world, should certainly infuse a spirit of optimism in the minds of the Indian growers. The important factor in the cultivation is the choice of a locality with moderately high altitude and with little fluctuations in daily temperatures. This could be easily attained in many places in India, e.g., Chittagong district, and it will be worth while for the intending drug growers to experiment in such localities.

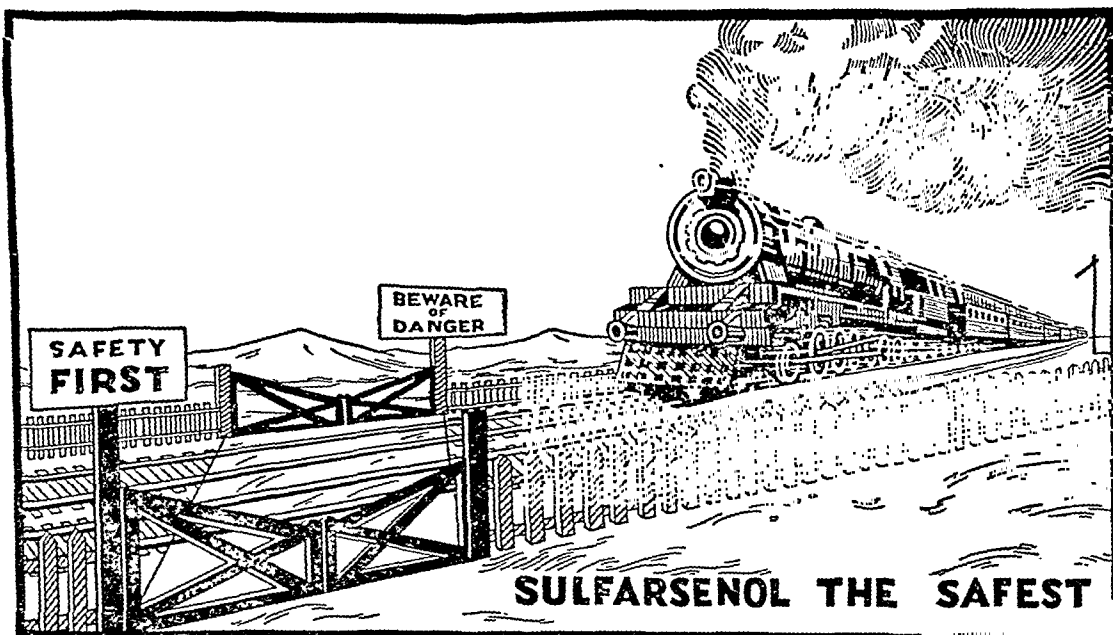
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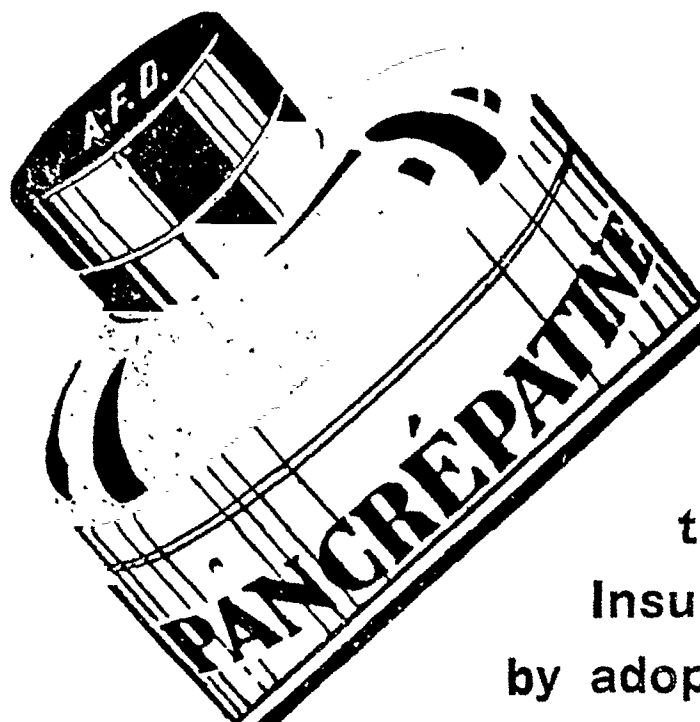
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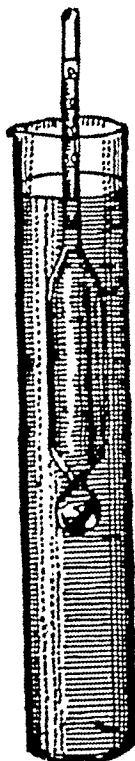
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Indian Medical Gazette

FEBRUARY

CASUALTIES IN WAR

WITH the publication of the volume dealing with casualties and medical statistics of the Great War, by Major T. J. Mitchell, D.S.O., R.A.M.C., and Miss G. M. Smith*, the *Official History of the Great War, Medical Services* comes to an end. This final volume is so very important that we cannot but review it in our editorial columns, for a great number of our readers who served during the Great War will be interested in the amazing and important amount of information which it contains. In passing, however, we would urge that a complete set of these volumes should be in every large medical library in India, and in the office of every administrative military medical officer.

The present volume owes its inception to the farsightedness of the late Sir William Leishman, D.G. Army Medical Services, who determined that the lessons to be learned from this wealth of material should be made available for all time. In September 1914 the Medical Research Committee (which became the Medical Research Council in 1920) came forward with an offer of the services of their statistical staff and money grants for the collection of medical statistics, and this offer was accepted by the Army Council. In June 1917 the War Office took over the task. An official medical history index card was adopted and introduced for every patient admitted to medical units throughout all armies of the British Empire. Completed index cards were sent to the Medical Research Council every six months, and a uniform method of analysing the statistical data was adopted. The ever-growing needs of the department necessitated a move to the British Museum and then to special quarters in Endell Street in London, and by May 1919 the staff of this central statistical office numbered 225 and cost £18,000 annually. In September 1919 Major-General Sir William Macpherson was appointed editor-in-chief of the volumes of the *Official Medical History of the War*, and in October 1920 the central statistical organisation was taken over by the Ministry of Pensions. The military medical services throughout the British Empire have

good reason to honour the memory of Sir William Leishman, and the publication of the present volume will arouse still further recognition of his devoted services to the cause of military medicine.

Prior to the Great War the only official British military medical statistics available were those of the South African War of 1899-1902, and throughout the book the statistics of the Great War are compared and contrasted with these. The colossal effort which the British Empire put forth in the Great War may be realized from the fact that the total casualties sustained, for all armies and all fronts, exceeded a figure of eleven millions—killed, missing, taken prisoner, and sick (including non-battle injuries). 'This volume', writes Major Mitchell in his preface, 'records over eleven million casualties sustained by the British Expeditionary Forces at home and in the various campaigns overseas during the Great War. In that figure are included both the casualties of the battlefield and those occasioned by disease and injury. It is not the grand total, for there were many unavoidable omissions in the records. Even so, the wastage which it represents in the manhood of the British Empire alone proclaims the cost of modern warfare. Behind these figures lie tales of heroism, constant hardship and supreme sacrifice, which find no place in a bare analysis of casualties. They have nevertheless inspired this work in the hope of furthering research to alleviate suffering and prevent disease.....All losses of personnel were, fortunately, not permanent. It has been estimated that, of the casualties admitted to medical units, 82 per cent. of the wounded and 93 per cent. of the sick and injured were able to return to some form of duty in the Army. In these results were surely evident the devotion and untiring skill rendered to the nation in her time of need by the medical profession, nursing services and the men and women associated with them'.

At first sight the book appears to consist of masses of statistical tables held together by a thread of narrative. The more one studies the book, however, the more valuable becomes the information to be derived from it. It falls into four main sections. First the general statistics for all forces taken together are considered; then those for each theatre of war in turn. It was soon realized that it would not be humanly possible to analyse eleven million statistical index cards; a representative sample of approximately one million, referring to British troops (only) on all fronts, was analysed. Finally is a section dealing with the aftermath of the War—a review by the Ministry of Pensions of temporary and permanent disability and disablement caused by the War. In place of the usual classification into 'wounded' and 'sick', the casualties are divided into 'battle casualties' and 'non-battle

* *History of the Great War based on Official Documents. Medical Services. Casualties and Medical Statistics of the Great War.* By Major T. J. Mitchell, D.S.O., M.D., Ch.M., R.A.M.C., and Miss G. M. Smith, M.B.E., M.A. Published by His Majesty's Stationery Office: London. 1931. Pp. 382. Price, £1-1-0d. net, 'postage extra'. (Obtainable from Messrs. Thacker, Spink & Co., Ltd., Calcutta, and all Agents for Government Publications, India.)

casualties'—the latter including all cases of sickness or injury independent of any act of the enemy.

The rôle of an efficient military medical service does not end with the care of the sick and wounded and the carrying out of its sanitary duties; far more important in modern warfare is its rôle in reducing the wastage of war and in maintaining man power. Diseases must be prevented rather than cured, casualties smoothly and rapidly evacuated, deaths and disablement reduced to a minimum, and every man returned cured as soon as feasible, either to the front line or to whatever form of military duty he is still capable of carrying out. Hitherto the tendency has been to emphasize the humanitarian aspect of the military medical officer's task, but modern war has become so grim a business that in future emphasis will be laid on the rôle of the military medical officer in keeping corps formations up to strength. And here comes the first of the big problems sketched in all too brief outline in this book. In peace time the army medical officer may not have much to do; in war time he cannot find time to carry out all his duties. The British Army at home and overseas in 1913 numbered 212,355: in 1918 it numbered 4,796,088. To meet the requirements of so immense an expansion the years 1914–1916 saw improvisation, with all its inevitable wastage and inefficiency, on a colossal scale; it was only in 1917–1918 that the expanded medical organization became really efficient. In the end an unparalleled degree of efficiency was attained. For example, in France all cases of chest wounds were collected together and evacuated to the base in specially-fitted-up canal barges, thus saving them from the jolts and jars of road and rail transport; whilst in Mesopotamia the end of the war saw the river convoy system of evacuation of sick and wounded working smoothly, evenly, and efficiently.

'The longer peace continues, the more difficult it is to prepare for war', remarks Field-Marshal Sir William Robertson, and this applies to the medical services just as much as to the combatant ones. 'It is not surprising', writes Major Mitchell, 'that when the need arises it is difficult to turn from the minor problems of peace to those born of a Great War, and to think out with imaginative foresight a broad policy that will create methodically and smoothly the medical arrangements necessary in the United Kingdom and overseas for millions of men'. The expansion of the R. A. M. C. during the war is indicated by the following figures:—

	Officers	Other ranks
August 1914		
R. A. M. C. ..	1,279	3,811
R. A. M. C. (Territorials) ..	1,889	12,520
August 1918		
R. A. M. C. ..	10,178	100,176
R. A. M. C. (Territorials) ..	2,885	30,923

'Historically, these figures show the magnitude of our effort, and if they are considered in relation to the strength of the forces for which they were required, they ought to help in calculating requirements in advance, should the necessity occur again.' In passing, it may be remarked that because a man is a brilliant surgeon in civil life, it does not follow that he possesses a born genius for organization and administration of a field ambulance or a base hospital; his sergeant-major may be better at that than he is.

In comparison with the figures for the Great War, it is interesting to note that during the Crimean War the average number of British troops engaged was 97,864: in the South African War 448,435 men were mobilised, and the average number of effectives was 208,226.

General survey of all casualties

Turning next to the general survey of all casualties, the general ratio of battle casualties to non-battle casualties was as 1:2.10, and the ratio of killed to wounded as 1:5.19. The percentage of deaths among the wounded admitted to hospital was 7.60; among the sick 1.16—the corresponding figures for the South African War being 8.62 and 3.39 respectively. In every theatre of the Great War the percentage of deaths from disease was lower than in the South African War. Of the deaths from wounds 55 per cent. occurred in the casualty clearing stations or other front-line medical units.

A belief which is firmly rooted in the minds of combatant officers is that the medical services are alone responsible for the collection, evacuation and housing of all casualties. This is erroneous; 'it rests with the army commander to decide whether or not an attempt is to be made to collect, protect, evacuate and treat all casualties. The medical services are not responsible for policy; they can only render advice and carry out to the best of their ability the policy adopted. If an attempt is to be made to collect and evacuate all the casualties in an extensive and prolonged engagement, the limited regular resources of the medical services are insufficient and supplementary personnel, equipment and transport must be authorised by the staff and provided by the respective services or departments concerned. This can only follow on a close liaison between the staff and the administrative medical officer of the formation'. At the landing at Gallipoli, for example, it was decided by the army commander that the small craft engaged on disembarking troops must on no account be diverted to take wounded back to the waiting ships. Only during the afternoon did six specially-equipped launches pulled by tugs become available for embarking the wounded,—each carrying 12 lying down or 36 sitting up cases. The extra hardship suffered by the

wounded lying out on the beaches was recognised as part of the cost incurred in a successful landing.

So urgent is the need for extra stretcher bearers in intensive fighting that in France the number per battalion was increased from 16 to 32 in the battles of the Somme in 1916; in the attack on Vimy Ridge in 1917 an extra 100 stretcher bearers per division were allotted; whilst in the third battle of Ypres in 1917 no less than 600 fresh stretcher bearers per division were supplied every twelve hours. At first men unfit for heavy duties were detailed for work as stretcher bearers, but this at once proved a mistaken policy. And what is true of the front line with regard to the need for extra personnel and equipment in heavy fighting, is also true of the casualty clearing stations, and down the line of communications to the base hospitals.

A point which emerges from the study of the statistics in France is the necessity to concentrate skilled medical and surgical service as far forward as possible. Of the wounded 30 per cent. admitted to the casualty clearing stations required and received urgent operative measures in these stations, whilst 55 per cent. of the total deaths from wounds occurred in field ambulances or casualty clearing stations.

Many medical officers who served during the War will agree with Major Mitchell in his remarks on the extreme necessity for the army commander to let his chief administrative medical officer know what he is doing. Only too often the first intimation that a big battle is commencing may be the unexpected arrival of hundreds of wounded, the precursors of thousands more to come. If the medical services are kept in the dark no preparations can be made beforehand, and confusion becomes confounded. This leads to congestion and increased suffering on the part of the wounded. Further, if the administrative medical officer is consulted beforehand, he can often estimate the number of casualties likely to occur and inform the army commander of the extent to which his forces will be depleted by each day's fighting. Even the American Army suffered from this, despite two and a half years' experience of their allies.

Among other erroneous beliefs which the War destroyed was that a fairly accurate forecast could be given of the number of casualties likely to be incurred beforehand. The old fashioned estimate was that casualties were likely to number 10 per cent. of 3/5ths of the force operating. Examination of thousands of documents shows that such a formula is quite unreliable. During the first two days of the battle of the Somme in 1916 the 17 divisions concerned lost in killed and wounded on an average 101 officers and 3,320 other ranks per division. The American Army finally entered France with a medical personnel varying from

8.6 to 10 per cent. of the total strength, and a provision for the hospitalisation of 15 per cent. of all troops concerned.

An interesting table on p. 40 classifies the percentages of wounds caused by different weapons as follows:—

Rifle or machine-gun bullet	38.98 per cent.
Shells, trench mortars, etc.	58.51 per cent.
Bombs and grenades	2.19 per cent.
Bayonet	0.32 per cent.

The proportion of battle to non-battle casualties varied very much in the different theatres of war. It speaks volumes for the medical services on the western front that, in spite of the awful conditions of trench warfare, the health of the troops was so good. The following are the figures for different fronts:—

		RATIO	
		Battle casualties	Non-battle casualties
France and Flanders,	1914-18	1	1.31
Italy,	1917-18	1	8.12
Macedonia,	1915-18	1	20.25
Dardanelles,	1915-16	1	2.11
Egypt and Palestine,	1915-18	1	9.78
Mesopotamia,	1914-18	1	9.63
N. Russia,	1918-19	1	10.73
E. Africa,	1916-18	1	31.40
S. W. Africa,	1914-15	1	15.58
All fronts		1	2.01
S. African War,	1899-1902	1	15.11

The daily sick rate of the British Army in time of peace is about 0.12 to 0.14 per cent. Before the War an empirical figure of 0.3 per cent. daily had been accepted as the permissible degree of inefficiency due to sickness. That this was an ample margin is shown by the fact that on the western front nothing like this figure was reached. Only in the four most unhealthy theatres of war was it reached or exceeded; these were Macedonia 0.36 in 1918; the Dardanelles 0.48; Mesopotamia 0.36 in 1916; and East Africa 0.72 in 1917, and 0.39 in 1918.

Diseases of the war

'The outstanding feature of this statistical review of diseases of the War, whether the ratio be high or low', writes Major Mitchell, 'is the large number of men rendered ineffective by the simple ailments of every-day life, such as diseases of the respiratory and digestive systems, rheumatic fever and its allied conditions, local and general injuries, skin diseases, minor septic infections, and influenza'. A second great group of diseases, equally prevalent in both the South African and in the Great

TABLE I
Incidence of the principal diseases in the Great War per 1,000 strength

	Enteric fevers		Tuberculosis		Pneumonia		Venerenl diseases	Malaria		Dysentery		Influenza		War nephritis		Jaundice	
	A	D	A	D	A	D	A	A	D	A	D	A	D	A	D	A	D
France and Flanders— Aug.—Dec.,	1914	2.45	0.30	1.85	1.99	0.28	17.32	6.04	0.02	4.53	0.02	7.78	0.01	0.55	0.02	0.49	0.02
	1915	5.86	0.26	3.22	3.26	0.41	29.65	7.27	0.01	2.61	0.04	75.11	0.04	6.78	0.16	2.52	0.02
	1916	2.07	0.02	1.02	1.13	0.10	18.23	0.01		4.37	0.03			7.42	0.07	0.14	0.00
	1917	0.67	0.01	0.88	1.14	0.10	25.60	0.41	0.00	3.18	0.02			8.03	0.11	0.50	0.00
	1918	0.20	0.01	0.66	1.03	0.19	32.36	1.47	0.00	6.58	0.02	157.81		3.46		0.68	0.00
Italy,	1918	1.50	0.15		2.20		41.80	2.95		9.52	0.18	146.72	6.12	6.53		7.63	
Macedonia— Oct.—Dec.,	1915	2.79	0.08		0.80	0.08	6.82			13.32	0.23	13.06				6.24	0.01
	1916	8.96	0.32		0.59	0.08	20.80	259.48	2.33	66.49	1.37	2.04				4.72	0.01
	1917	2.90	0.10		1.53	0.24	11.06	391.12	1.25	31.72	0.68	5.39				1.75	0.01
	1918	1.05	0.05		0.37		14.72	458.94	2.11	73.31	1.34	154.27	2.03			1.04	0.02
Dardanelles, 1915-1916		80.49	2.82	4.30	5.78	0.84	23.45	12.58	0.04	253.94	6.93	26.70	0.03	5.35	0.17	68.59	0.26
Egypt and Palestine, 1916-1918	1916	16.54	0.37		5.75	0.61	75.31	7.57	0.04	29.78	0.43						
	1917	3.07	0.14		1.22	0.29	28.10	45.46	0.39	23.27	0.75						
	1918	1.89	0.22		6.53	4.44	50.44	180.86	3.35	21.23	1.14	42.01	0.15				
Mesopotamia, 1914-1915		6.18					19.42	152.36		109.06	1.04						
N. Russia, 1918-1919	1916	18.50					21.11	102.54		92.34							
	1917	4.99	0.51				19.98	52.24	0.38	38.89	0.93						
	1918	2.60	0.36				16.12	52.10	0.40	29.86	0.74						
		3.21			3.43		32.40			1.07		67.76					
E. Africa— June—Dec.,	1916	2.91	0.68		9.48	2.44											
	1917	2.45	0.47		32.60	8.76	1,039.11	5.38	5.38	182.21	6.26						
	1918	1.68	0.32		49.30	12.58	1,422.84	9.84	9.84	277.01	8.46						
		6.97	0.79		3.76	0.36	559.09	1.68	1.68	80.28	2.10						
S. W. Africa, 1914-1915							41.12	15.70	0.06	21.67	0.39	31.88					
United Kingdom— Aug.—Dec.,	1914	0.16	0.02	0.87	1.06	0.14	7.11	0.53	0.00	0.17	0.00	4.72	0.00	0.21	0.02	0.16	0.00
	1915	0.22	0.02	3.18	3.28	0.44	23.51	1.24	0.00	0.39	0.00			0.93	0.06	0.33	
	1916				2.57		29.73	0.67		0.26		22.57	0.05				
	1917				2.89		31.93	1.81		0.28		16.98					
	1918				5.88		33.36	1.75		0.22		86.55					
S. African War, 1899-1902		103.88	14.45	3.07	4.57	0.85	34.45	45.30	0.15	68.60	2.42	16.01	0.00	0.88	0.06	11.16	0.00

Note.—Blank spaces = No information available. A = Admissions per 1,000 strength. D = Deaths per 1,000 strength.

War, are venereal diseases, malaria, and dysentery. A third group were unexpected or forgotten diseases which the military medical services had never expected to encounter—tetanus, gas gangrene, trench fever, typhus, war nephritis and gas poisoning.

Turning to the different causes of disease, the incidence of the common infectious diseases—chicken-pox, cerebro-spinal fever, measles, etc.—was remarkably low and compares favourably with that of peace time. Cerebro-spinal fever was rather prevalent among the troops in the United Kingdom in 1915–17, and small-pox in Mesopotamia in 1917–18: otherwise the preventive measures taken had excellent results.

On the other hand, in the world-wide operations which occurred infectious diseases associated with the East assumed a special importance. And here table I, compiled from the different regional statistical tables given in the second part of the book, is well worthy of study.

We may study table I in two different ways: first from the point of view of the diseases concerned, secondly with regard to the different theatres of war. Unfortunately there are many blanks in the table, where information is lacking, but in spite of this the lessons to be learnt are important.

The outstanding disease of the Great War was malaria. It is the greatest enemy of the British Army, both in peace and war (under which circumstances it is rather surprising how few malariologists are associated with that army). It was not important in France, of course, and the unexpectedly high figures for 1914–15 almost certainly chiefly represent relapses in British and Indian troops brought from the East. It was but little in evidence in the British troops in Italy, who were fighting away from the malarious zones of that country. In Macedonia it was very severe and increasingly severe, until in 1918 almost half the men were infected. The figures for Egypt and Palestine are unfortunately pooled together; Egypt is almost malaria-free, whereas Palestine in 1916–18 was saturated with malaria, especially Jerusalem and the Jordan Valley. So severe was malaria on the Palestine front that working parties had to be sent out at night to oil the mosquito-breeding places and shell holes in No Man's Land, whilst Allenby's victorious advance to Damascus was followed by a severe outbreak of malaria owing to the troops having fought over mosquito-infested terrain where the Turks had taken no anti-malaria measures.

In Mesopotamia the figures for malaria admissions appear surprisingly low to anyone who took part in that campaign. The disease was certainly very prevalent around Basra, Kurna, and in the Euphrates Valley, but many men were given quinine and not sent to hospital.

The desert camps, such as Shaiba, were more or less malaria-free, whilst the fall in incidence as Bagdad was occupied and the army moved into healthier upland country is noticeable.

In the East African campaign malaria reigned supreme. The figures (which are for troops only, and exclude followers) are colossal; the admission rate for malaria reached a figure of 1,423 per mille in 1917, with a death rate of 9.84 per mille.

The second Great War disease was dysentery. Sanitary measures held it in check on the western front, but its incidence was definitely higher on the Italian front. In Macedonia it was very prevalent and an important cause of death. In the Dardanelles the admission rate reached the huge figure of 254 per thousand with a death rate of 6.93 per mille. General Sir Ian Hamilton remarks ironically in his *Gallipoli Diary* that dysentery was probably the reason why the Greeks were ten long years in taking Troy, whilst the authors quote the following passage from A. P. Herbert—(*The Secret Battle*).

'It became universal; everybody had it, and everybody could not be sent away The men could not be spared In the worst stages there was only a dull misery of recurrent pain and lassitude and disgust. finally there came a terrible debility, a kind of paralyzing lassitude when it needed a genuine flogging of the will for him to lift himself and walk across the camp.'

The combined figures for Egypt and Palestine probably fail to represent the real conditions in the Palestine campaign. In Mesopotamia the steady improvement in succeeding years may almost certainly be attributed to steadily improved sanitation; in the 1914–15 campaign the disease was universally prevalent, almost everybody contracted it, but few were sent to hospital—the admission rate of 109 per thousand shown for those years fails to reveal the true incidence of the disease. In East Africa the disease was horribly prevalent and in 1917 conditions were worse than in the Dardanelles—an admission rate of 277 per thousand and a death rate of 8.46 per mille. In the United Kingdom the disease was almost absent.

The figures for dysentery for the eastern theatres of the Great War are definitely worse than those in the South African War, and Major Mitchell and his co-author deplore this fact—'Must medical science and army organisation accept defeat and plead that these diseases are a necessary concomitant of war? . . . It is easy to make excuses for the high incidence in the early days of the War and say that the army personnel was insufficient for the demands made upon it. If it is left at that, there will be little or no improvement in the future'.

It must be remembered, however, that in 1914–18 our conceptions of dysentery were all wrong. It was supposed that the vast majority

of all cases were of amoebic origin, and the thousands of sufferers in every theatre of war were drenched with emetine (which probably made the individual prognosis worse). To-day we realize that some 80 per cent. of all cases are of bacillary origin; and in 'the next great war'—if there is one—salts and bacteriophage are likely to be extensively used, water supplies may possibly receive 'phage treatment, whilst prophylactic inoculation with vaccines also suggests itself.

The third great cause of morbidity are pulmonary diseases—pneumonia, pulmonary tuberculosis, and influenza. The onset of the influenza pandemic of 1918 is well shown in the figures; it was to kill more than the deaths in the whole of the Great War put together. To-day it is probably not incorrect to say that the ætiology, treatment and prevention of influenza (and of the allied common cold) constitutes the biggest unsolved problem in medicine.

The pneumonia figures are high for Flanders in 1915, for the Dardanelles, and for Egypt and Palestine; in the last connection it is evident that fatigue and exhaustion in desert fighting in cold weather may be an important factor. In East Africa pneumonia was of very great importance, and an important cause of mortality. On the whole, for the eastern theatres of war, it cannot be said that the figures show any improvement on those for the South African War. With regard to tuberculosis—almost all of it pulmonary tuberculosis—the only figures above normal perhaps are those for the United Kingdom and Flanders in 1915, and that for the Dardanelles—associated with extreme hardship and fatigue: as we shall see later, however, pulmonary tuberculosis becomes a very important cause of post-war debility and disablement.

The figures for enteric fevers are of very great interest. As is well known, these diseases were predominant in the South African War—an admission rate of 104 and a death rate of 14.45 per mille. This was followed by the introduction of prophylactic inoculation by Leishman and Wright, and the British Empire armies entered the War well protected by T.A.B. vaccine. The authors claim that the figures for the Great War show that this measure effected an immense saving of life, and—especially in view of the fact that the French armies suffered rather severely from the disease—this claim is probably justified. On the other hand a great deal of the vast improvement must be attributed to improved army sanitation. A third factor which may perhaps have operated, is that it was almost a military crime to diagnose enteric fever, except upon proved serological or bacteriological grounds! Where conditions of great hardship and exposure are concerned, the Dardanelles in 1915-16 and the attempted relief

of Kut in 1916, it would appear as if the immunity conferred tends to break down.

War nephritis is a disease whose ætiology has never been satisfactorily explained. It was prevalent in Flanders, in Italy, and in the Dardanelles. The incidence was greatest in the cold weather months, 95 per cent. of cases occurred among the front-line troops, 75 per cent. of cases occurred among the men, and only 25 per cent. among officers. 'It seems feasible to suggest that the predisposing causes are cold and humidity, hard work and overloading the soldier with heavy equipment.'

The figures for jaundice are not of special interest, since the causes are not classified. The Dardanelles show a heavy incidence associated with conditions of hardship and exposure, but a very low mortality rate.

One of the most satisfactory features of the War was the almost complete freedom of the British Empire armies from undulant fever, cholera, typhus, relapsing fever, and plague. In Mesopotamia there was a little typhus in 1917-18—admission rate 1.25 per mille; a little plague in 1916-18—admission rates from 0.32 to 0.62; and some relapsing fever in 1918—admission rate 4.16 per mille. On the other hand all three diseases were held almost completely under control by the preventive measures adopted, and here the authors pay a tribute to the work of the Indian Medical Service in fighting plague in the towns and river shipping in Mesopotamia. An outbreak of cholera occurred in Mesopotamia in the spring of 1916—the source of infection being a water supply infected by the Turks, who were suffering considerably from the disease. Thereafter the disease was firmly controlled—the figures for admissions are 11.60 per mille in 1916, 0.68 in 1917, and 1.09 in 1918.

The figures for venereal diseases are not very satisfactory, in view of the fact that in every theatre of war the very utmost efforts were made to control this scourge of armies. An analysis of 91,231 cases from France shows that only 45 per cent. of these admissions were due to fresh infections contracted in that country; 42 per cent. had been contracted in the United Kingdom, and many cases were instances of recrudescence of old-standing infections. The figure of 19.42 per mille in Mesopotamia in 1914-15 refers almost entirely to infections acquired in India, and the first shipload of casualties to reach Bombay from Basra consisted very largely of venereal cases weeded out during the outward voyage of the transports to Basra. The statistics throughout emphasize the very much greater importance of gonorrhœa as a cause of war disability than of syphilis. The following figures may be quoted.

The moral of these figures is that one must expect an incidence of 2 to 4 per cent. of venereal diseases amongst armies in the field, even when every effort is being made to control

		RATIO	
		Syphilis	Gonorrhœa
France and Flanders,	1914-18	1	3.48
United Kingdom,	1914-18	1	2.47
American Army,	1917-18	1	3.80
British Army,	1925-28	1	7.27

them. It is to be noted that both the figures for France and Flanders and the United Kingdom show a steady rise in incidence as the War progressed and fresh drafts were enrolled and mobilized. The figures for Egypt and Palestine for 1916 and 1918 suggest that the 'pretty ladies' of Cairo are particularly dangerous, whilst the figures for North Russia and South West Africa are also surprisingly high!

We may next consider table I from the point of view of the different areas concerned. In France and Flanders the year 1915 stands out as the unhealthiest of the five years; this is probably due partly to the fact that the physique and stamina of the territorials and the early Kitchener's armies was not equal to that of the 'old contemptibles', partly to the hurried medical improvisations which were resorted to to meet with an unparalleled situation. On the whole the work of the medical services on the western front was magnificent. They dealt in all with six million casualties, of which four million required evacuation to the base, and one and a quarter million evacuation overseas. Fifty-four per cent. of the total admissions were returned to duty in the theatre of war—this representing a total man power of 2,981,232—to which must be added the figures for those returned from the United Kingdom to the front. The chief diseases met with were those common in civilian life, together with others peculiar to trench warfare and some which had never been anticipated. The average annual sick admission rate was only 646.55 per thousand, as against average rates in peace time of 346.4 in 1912 and 357.4 in 1913. 'Whilst it must be remembered that the figures represent admissions and not individuals, the results of modern warfare in a civilised country, as summarised for 1914-18 in France, are without parallel. However viewed, they arrest attention and rouse the imagination. They demonstrate very forcibly the importance of medical problems in a titanic struggle, and drive home, as mere words will never do, the desirability of paying particular attention from the very outset of a campaign to the organisation which plays such an important part in the conservation of man power.'

The Italian campaign was marked chiefly by the great difficulties of evacuating sick and

wounded from a mountainous and Alpine terrain. Influenza, dysentery and war nephritis were the principal causes of sickness, whilst the incidence of venereal disease was high.

In Macedonia climatic conditions were extreme; intense cold in winter accompanied by a wet season, and great heat in the summer, broken by heavy thunder and rainstorms. Road and rail communications were bad. The force was saturated with malaria year in and year out, the disease being aggravated by the hardships of trench warfare and spasmodic heavy fighting. Dysentery was extremely important. The incidence of venereal diseases was low.

It was in the Dardanelles that the late unlamented Great War appears to have achieved its nearest approach to hell. Malaria was unimportant, but dysentery was intense and virulent. The figures of incidence are high for all diseases, whilst battle casualties reached the appalling figure of 587.91 per 1,000 strength—higher than any figure for France or elsewhere. We cannot do better in this connection than quote verbatim from the authors:—

'The outstanding features of the Dardanelles campaign were the comparative shortness of its duration, the intensity of the struggle in a confined area, and the exceptionally large numbers of battle and non-battle casualties. From the medical services' point of view its chief characteristics were difficulties in the evacuation of sick and wounded, and in preserving a state of health among the troops. At the outset of the campaign the estimates of probable casualties fell far short of the actual numbers, and the medical arrangements were inadequate. This was due to the lack of training in handling casualties from combined naval and military operations, to the want of sufficient ambulance launches, and also to the great difficulties of removing the wounded, under heavy fire, from beaches within a few yards of the front line when every available boat was required for bringing ashore fresh troops. As time wore on, the arrangements improved, but at no time did the Gallipoli Peninsula afford the regular routes of evacuation from front line to the base such as other theatres of war enjoyed. Rough tracks and gullies were substitutes for roads, down which casualties were conveyed to the beaches, for the most part by hand-carriage but occasionally by ambulance wagon. Small sea craft played the part of ambulance convoys to the ships waiting to transport the sick and wounded to hospitals in Mudros or Egypt, there to be retained or, if need be, despatched still further by sea to Malta or to the United Kingdom.

The health of the troops and the problems of sanitation were constant sources of anxiety to the medical services. Local water supplies were insufficient for the needs of the force and had to be supplemented from Egypt. The fact that the area of operations was separated from its base in Egypt by a two to three days' voyage of approximately 700 miles added to the difficulties of obtaining supplies and comforts for the sick and wounded. Climatic conditions tried the troops to the uttermost; the discomfort of the heat in summer with its attendant dust and flies was equalled in intensity by that of the blizzard in November, which alone caused some thousands of casualties from exposure. Dysentery and diseases of the digestive system accounted for approximately 50 per cent. of the admissions to hospital for sickness among British troops, which showed a ratio of 1,239.91 per 1,000 strength for non-battle casualties. One of the most trying features of the campaign for the troops was their inability to get beyond the range of enemy fire while out of the trenches. The establishment of rest camps at Imbros and elsewhere in

the later stages of the campaign was no doubt the means of restoring to health many war-worn men.'

The figures for Egypt and Palestine are unfortunately pooled together, as the Palestine Expeditionary Force was based on Egypt. The average annual sick rate during the war—750.40 per 1,000—compares very favourably with the post-war rates of 741.8 and 682.3 in 1921 and 1922 respectively. (The figures refer only to British and Dominion troops, as there is no reliable information regarding Indian casualties.) Malaria was the scourge of the Expeditionary Force in Palestine, dysentery was very important, and pneumonia not unimportant. Evacuation of the sick and wounded across the desert worked well, and during 1918 92 per cent. of all casualties in the Palestine Expeditionary Force were evacuated to the base in Egypt.

Mesopotamia is the theatre of war in which readers in India will be most interested. Here the state of affairs during the earlier years is notorious; battle casualties were heavy—142.83 per 1,000 for the whole campaign—and the force was scourged by malaria and dysentery. We cannot do better than again quote from the authors:—

'The nature of the operations and the type of country and climate in which they were conducted give an added interest to the campaign, and explain in part the difficulties encountered by the medical services. There were periods of mobile warfare and manœuvre, by day and night, intensive trench warfare, cavalry actions and raids by mechanised forces. In 1915-16 success, failure, administrative breakdown and reorganisation followed in quick succession. Extreme heat in summer and great cold in winter attended the operations by land and river, through marsh and mud or over sandy desert, in the plains and in the mountains. Casualties had to be evacuated great distances. At first there was no broad-gauge railway to link up the various posts on the lines of communication and facilitate the evacuation of sick and wounded. Such roads as existed were bad, and the rivers and waterways forming the main lines of communication with the base, although navigable, were difficult to navigate. Many of the native towns were situated on the river banks and, one and all being overpopulated and insanitary, constituted a fertile focus for the spread of disease. Basra, the base, was unhealthy, malarious, intersected by creeks and embedded in date groves. By river it was 132 miles from Amara, 243 from Shaikh Saad, 285 from Kut-al-Amara, 467 from Ctesiphon, and 498 from Baghdad. By sea it was several days' journey to India and many weeks to the United Kingdom.

The Expeditionary Force operating in such a country and under such conditions was bound to have problems peculiar to itself. Knowledge, resource and ingenuity were all required to preserve the health of the troops, collect and evacuate casualties, accommodate, and treat them. The medical history of the campaign and the statistics of the different years forcibly demonstrate the losses which accrue from neglect and lack of foresight, and the benefits derived from adequate provision and proper organisation. The original force was well organised and trained for the initial operations. It fought with success for a year, but that very success was the undoing of its medical services. As long as the operations conformed to the type practised during peace the medical services did yeoman work. They were, however, being gradually undermined by improvisation and a strategical policy which broke down the principles of medical work in the field. Casualties were

evacuated forwards with the force instead of backwards to the lines of communication and the base; mobile medical units were depleted by having medical personnel and equipment detached; and the lines of communication were not properly organised for the evacuation, reception and treatment of casualties. Just when the most ambitious part of the operations was put to the test at Ctesiphon in November 1915, the medical services, instead of being at their strongest, were at their weakest. The plan failed, a large force was besieged in Kut, and when the Indian divisions arrived from France they were hurried to the front without their full complement of medical units. The strained and inadequate medical units at the front and on the lines of communication could not cope with the influx of sick and wounded. The transportation and treatment of casualties broke down, and the resulting conditions are well described by the late Sir Victor Horsley as "grossly insanitary and inhuman".

Two diseases of special importance in the campaign in Mesopotamia were scurvy and heat stroke with heat exhaustion. In July 1916 scurvy was responsible for 7 per cent. of the total admissions for sickness among the Indian troops; this figure rose to 35 per cent. in August, and was 22 per cent. in September. As the force became reorganised and rations improved in quantity and quality there was a gradual decrease in the number of cases admitted to hospital.

With regard to heat stroke and heat exhaustion, the most trying period of the campaign was from the 7th to the 28th of July 1917. Here the maximum daily temperatures at Basra and Bagdad ranged from 110°F. to 122.8°F. and the minimum daily temperatures from 76°F. to 86°F. From the 8th to the 24th inclusive the maximum at Bagdad never fell below 116°F. During this period there were 3,445 admissions from the effects of heat, with 482 deaths. The men who suffered most were British troops employed on works, mechanical transport, signalling, military police and in kitchens. The older men (over 35 years of age) suffered more than did the younger troops.

In passing, it may be noted here that on only two occasions during the Great War—as far as one knows—were casualties carried forward with the advancing armies instead of being evacuated towards the base. During Allenby's victorious advance on Damascus, the troops advanced across the Judean hills on to the plains of Samaria; here the lines of communication back through the hills were extremely difficult, the army was advancing rapidly and successfully against a routed and demoralised enemy, and comfortable rest camps lay ahead in the plains. Under these circumstances the manœuvre was probably justified. The second was at the end of the first day's fighting at the battle of Ctesiphon. Here the wounded—some 2,000 or more in number—were carried forward into the entrenched camp at the Arch of Ctesiphon, and placed for safety in the centre of the camp, whilst the night-long Turkish counter-attack developed. The next day they were evacuated back nine miles to the waiting

river steamers at Lujj under conditions of incredible hardship and suffering. Military necessity and shortage of troops for protective purposes may here have made this manœuvre necessary, but its consequences were at least unfortunate. A rapidly-advancing mobile force may have to carry its casualties with it, but the old rule of immediate evacuation of casualties towards the base still holds more strongly than ever.

The North Russian campaign was launched in April 1918, and an extraordinarily mixed force of British, French, Italian, American, Serbian and 'loyal' Russian troops occupied the towns of Archangel and Murmansk and the surrounding country. The final withdrawal was accomplished by the 12th October, 1919. Frost-bite was a novel disease with which the medical officers in this campaign had to contend. For the rest we may quote from the authors:—

'It was not, however, in the actual operations but in the isolation of the troops, and in the nature of the country and the climate that the greatest danger lay. Although relieved later by fresher and fitter volunteers, the British force at the outset of the campaign was composed for the most part of war-worn troops from other fronts. Many had experienced extremes of heat and cold in other countries, with heat predominating, but in North Russia they were operating in an Arctic climate where the winter was long, dreary, dark and very cold—conditions which were likely to have a very depressing effect upon troops who had already experienced war and its hardships. The country consisted either of vast open spaces with bogs, rivers, marshes and lakes, frozen hard in winter, or of endless snowclad forests. Distances were long, journeys were wearisome and transport was difficult and slow, necessitating special arrangements for the evacuation of cases over trackless wastes.

The chief difficulties of the campaign from the medical point of view included the use of special transport for ice and snow; the treatment of wounds under exposed and trying circumstances; the grave risk of contracting infectious disease from the cosmopolitan inhabitants of the towns or from their insanitary surroundings; and the anxiety lest debilitating diseases, nervous or otherwise, brought about by war weariness, distance from home, trying conditions and the depression of an Arctic winter, should beset the troops. The force was, however, well equipped to combat all the consequences of active service in such a country, and it speaks well for the stamina of the men and for the measures adopted that only a few cases of neurasthenia were reported as admissions to hospital. All things considered, the comparatively low ratio of 908.50 per 1,000 of ration strength of the British troops admitted to hospital for the period of the campaign on account of disease or injury must be taken as indicative of the success of the preventive methods employed by the force.'

The East African campaign was characterised by an enormous amount of sickness, both among the troops and the followers, who numbered three to six times the strength of the combatant forces in different years. The morbidity figures were appalling, as the following table for 1916-18 shows. (The figures are based on 1916-18, as statistics for 1914-15 were not available.)

Average annual casualties 1916-18, per 1,000 strength.

Battle casualties:	troops	71.46
	followers	7.44
Non-battle casualties:	troops	2,244.36
	followers	1,047.57

The figures here for war diseases become almost colossal:—malaria with admission rates up to 1,423 per 1,000 and a death rate of 9.84 per mille; dysentery up to 277 per 1,000 with a death rate of 8.46; pneumonia, admission rates up to 49 per 1,000, death rate 12.58.

The authors summarize the conditions present as follows:—

'The East Africa campaign presented many difficulties, both military and medical. It was a campaign of manœuvre and hard marching over mountains, through bush, and across rivers, lakes and swamps. Periods of drought and dust were followed by seasons of torrential rains and mud. At all times the fierce heat and luxuriant vegetation were productive of parasitic life which caused many diseases. Transport and supplies presented the gravest difficulties, and in many of the operations reliance had to be placed on a large force of carriers who were only human and an easy prey to disease. The lines of communication were long, and the evacuation of sick and wounded casualties was fraught with difficulties. The struggle was one where, in the early stages, an efficient medical service would have been invaluable; as General Smuts is reported to have described it as a "campaign against nature, in which climate, geography and disease fought more effectively against us than the well-trained forces of the enemy".

The force was a mixed one, comprising British and Dominion troops, Indian, African, and British West Indian troops, and a large force of followers, Indian and African, drawn from diverse races and districts, and speaking different languages. Casualties from wounds were not numerous, but the excessive sick rate and the constant care exercised to prevent the spread of disease, threw a heavy strain on the medical services.

The South West African campaign may be dealt with in a quotation from the authors:—

'The organisation of the force was at first hurriedly built up to meet the immediate needs of the different columns of which it was constituted. The outstanding requirements in the early days of the campaign were mobility and the power to endure heat, thirst and sandstorms in traversing difficult country until the desert strip, sand dunes and rocky gradients had been negotiated and the troops were in possession of the railways. It was a campaign of movement and manœuvre under trying conditions, climatic and geographical, with a constant battle against the want of a proper water supply.

From the medical aspect the chief difficulties were the supply of pure drinking water, the prevention of disease, and the evacuation of sick and wounded casualties over inferior roads with such transport as was available. As the campaign developed and control of the sea and the railway was gained, the medical organization was perfected to meet all demands, ensure comfort for the patients, and effect their transfer to stationary or base hospitals by ambulance train and hospital ship. Considering the nature of the country and the rigours of the campaign, the sick rate of 749.88 per 1,000 of the average strength of Dominion troops over the period of hostilities is remarkably low.

Native labour was to a large extent employed throughout the campaign on work connected with railways, transport and remount duties. Although there

are no exact figures, it is reported that the average daily number so employed was 15,000 and that the amount of sickness was small. Special arrangements had to be made by the medical services for their hospital accommodation and medical care, and it is noteworthy that there were no serious outbreaks of disease among them.

With regard to the British and Dominion troops stationed in the United Kingdom the most amazing feature is the healthiness of these armies in reserve. The newspapers at the time were full of laments about a C3 population; whether it was the beneficial effect of military training or not, the result of conscription was an A1 force. We may again quote the authors' summary:—

'During the years of the Great War almost every recruitable man in the country was medically examined either by a recruiting medical officer or medical board. This was a new experience for the British people, and the rather startling results tended to alter existing opinions of the physical efficiency of the nation. There arose in the minds of scientists doubts as to whether it would be possible to form and keep up to strength the large armies required for a modern world war, and whether the recruits accepted for service would deteriorate and break down on transfer from the comparative comfort of civil life to the new conditions of billeting, rationing, clothing, training and hard work. As every one knows, the armies required for service overseas were formed and kept up to strength with troops that were second to none. Statistically, the total admissions for sickness or injury for troops stationed in the United Kingdom for the period August 1914 to December 1918 show the low average annual ratio of 289.82 per 1,000 of strength in a force averaging a little over one and a half million troops per year. This ratio and

Ratio per 1,000 of strength

(Aug.—Dec.)	1914—1918		1908—13 and 1921—27	
	1914	1915	1908—12	1921—27
	78.94	282.19	368.9	346.4
	270.37	269.39	357.4	434.5
	344.14		376.4	346.0
			362.8	335.1
			333.1	333.1
			304.8	

It seems, therefore, reasonable to assume that the physical standard of the recruits was high, or sufficiently so for the strenuous work they had to undertake, and, moreover, that they suffered no deleterious effects from service at home.'

* * * * *

The wastage of war

Tables II and III have been compiled from the statistical tables given in the second section of the book, and bring out vividly the wastage of troops in modern war. They show the intensive character of the fighting in the Dardanelles, on the western front, and in the first three years in Mesopotamia. Everywhere, except in France, disease is more important than wounds, and sickness was of predominating importance in the campaigns in East Africa, Mesopotamia, the Dardanelles and Macedonia. Roughly speaking it may be said that an army

TABLE II

Battle and non-battle casualties in different theatres of war

				RATIO PER 1,000		
				Battle casualties	Non-battle casualties	Total
France and Flanders, August—December, 1914	..	..	..	448.23	356.15	804.38
	..	..	..	472.61	875.28	1,347.89
	..	..	..	487.39	481.60	968.98
	..	..	..	381.05	529.37	910.42
	..	..	..	440.47	595.16	1,035.63
Italy .. .. .	..	..	..	63.88	590.03	653.92
	..	..	..	53.31	1,126.39	1,179.71
	..	..	..	587.91	1,239.91	1,827.83
	..	..	..	75.70	740.59	816.29
	..	..	..	462.56	902.39	1,364.95
Macedonia .. .. .	..	..	..	344.24	1,309.10	1,653.34
	..	..	..	158.34	914.32	1,072.66
	..	..	..	12.78	702.69	715.47
	..	..	..	84.67	908.50	993.17
Dardanelles .. .. .	..	..	..	71.46	2,244.36	2,315.83
	..	..	..	48.12	749.88	798.88
			
Egypt and Palestine .. .. .	..	..	..
			
			
Mesopotamia .. .. .	..	..	..
			
			
N. Russia .. .. .	..	..	..
			
			
E. Africa .. .. .	..	..	..
			
			
S. W. Africa .. .. .	..	..	..
			
			
S. African War 1899—1902 ..				48.17	727.80	775.97

the annual ratios year by year compare more than favourably with the pre- or post-war peace-time ratios for sickness among troops in the United Kingdom. Indeed, as the following figures show, they have never been bettered:

lost 100 per cent. of its effective strength in five months in East Africa, in six and a half months in the Dardanelles, in eight months in Mesopotamia, and in a year in France.

TABLE III

Ratio per 1,000 of strength constantly in medical units

(Wounded plus sick)

France and Flanders, August—December, 1914	131.44
1915	103.12
1916	39.17
1917	48.25
1918	53.47
Italy 1918	40.92
Macedonia 1915-1918	92.01
Dardanelles 1915-1916	223.39
Egypt and Palestine 1915-1918	97.97
* Mesopotamia, July—October, 1915	91.53
April, 1916	86.23
July—December, 1916	78.81
May—December, 1917	47.46
January—December, 1918	41.69
N. Russia 1918-1919	47.18
E. Africa 1916-1918	120.92
S. W. Africa 1914-1915	31.66
S. African War 1899-1902	61.22

* Figures available only for the periods given.

* * * * *

An analysis of casualties

Chapter XX of the book deals with an analysis of 1,043,653 casualties admitted to medical units from British troops (only) serving

The aftermath of war

The last section of the book is a review of statistics for disability, disablement, war gratuities and pensions of the Ministry of Pensions for the ten years following the Armistice. The Medical Branch of the Ministry of Pensions was first set up in December 1917. In June 1919 the work was decentralized to eleven regional offices in various parts of the country. The medical boards were taken over by the Ministry of Pensions in April 1919, and reconstituted into three categories:—

- (1) boards for primary, immediate awards.
- (2) re-survey boards.
- (3) appeal boards.

The numbers boarded in the ten years 1919-29 totalled 4,878,285; and State compensation for some form or other of war disablement was given to 40.2 per cent. of those who served in the British Army. The numbers boarded reached a maximum of 1,259,899 in 1920-21, and fell to 47,424 in 1928-29.

During this ten years the diseases responsible for awards underwent a very important change. The following figures show the causes (a) of immediate disablement at the close of the war in 1920-21, contrasted with (b) the causes of permanent disablement ten years after the war in 1928-29.

Percentage proportion of causes of war disablement in

Immediate disablement, 1920-21		Permanent disablement, 1928-29	
Wounds and amputations ..	21.6 per cent.	Organic diseases of the heart ..	14.4 per cent.
Malaria	19.8 "	Tuberculosis	12.6 "
Functional diseases of the heart ..	7.5 "	Wounds and amputations ..	10.9 "
Rheumatism	6.1 "	Respiratory diseases ..	8.6 "
Respiratory diseases	5.9 "	Neurasthenia	8.2 "
Tuberculosis	4.6 "	Functional diseases of the heart ..	7.2 "

in the different theatres of war. It is claimed to be a representative sample of the total of over eleven million casualties which occurred.

Here the information is presented exclusively in tabular form, and hence does not lend itself to review. The casualties numbered 206,976 battle casualties and 836,677 non-battle casualties. A table shows that 67 per cent. of all battle casualties occurred among the infantry, 12 per cent. among the artillery, and the remainder among other arms of the service.

The regional distribution of wounds is given in the following figures:—

Lower extremity	39.75 per cent.
Upper extremity	29.95 "
Head, face and neck	16.58 "
Chest	3.78 "
Abdomen	2.27 "
Back	6.27 "
Undefined	1.40 "

* * * * *

The change over in this table is very interesting. Immediately after the conclusion of hostilities the chief causes of disablement were wounds, malaria, and functional diseases of the heart; ten years later organic diseases of the heart, tuberculosis, respiratory diseases and psychoses had become all important. Together with the results of wounds and amputations, it is these five great causes which are responsible for the permanent aftermath of the war in disability and disablement. In passing it is of interest to note that 68.2 per cent. of all awards for disablement were granted in 1920-21; by 1925-26 the proportion had fallen to 3.0 per cent. On 31st March, 1929, there remained only 113,000 pensioners, whose degree of permanent disablement remained unassessed.

The following figures show the total percentage ratios of the different causes of disability and disablement which led to awards in

the ten years after the war, up to 31st March, 1929.

	Percentage incidence of disablement due to
Wounds and amputations ..	41.6 per cent.
Neurasthenia ..	8.6 "
Malaria ..	7.6 "
Functional diseases of the heart ..	6.8 "
Respiratory diseases ..	5.3 "
Rheumatism ..	4.9 "

Despite the great importance of dysentery during the war, the disease was only responsible for 1.1 per cent. of the total awards—whether immediate or permanent.

With regard to the degree of severity of the disablement produced, the figures are divided into three groups representing respectively degrees of disablement of (a) 70 to 100 per cent., (b) 40 to 60 per cent. and (c) 30 per cent. and under. Wounds and amputations show respectively 58.2, 67.5 and 40.5 per cent. in these three groups. The vast majority of cases of tuberculosis and psychoses fall into the grade of 70 to 100 per cent. disablement; whereas malaria, functional diseases of the heart, neurasthenia and rheumatism appear most prominently in the 30-per-cent.-and-under category.

Apart altogether from the question of monetary awards, the close of the Great War found the Ministry of Pensions faced with an unparalleled state of affairs with regard to the necessity to provide medical and surgical treatment for the sick and wounded. 'The limbless wanted limbs', write the authors, 'face wounds required plastic surgery, shell-shocks demanded a remedy for their multitudinous complexes and complications, the insane needed mental institutions, and the tuberculous sanatoria. Men from the East brought with them malaria, dysentery, bilharziasis, and other tropical diseases. The blind sought training, the paralysed a home. The situation was without precedent, analogies were few, and doctors, whether clinicians or administrators, found themselves launched on a little-charted sea. Guiding principles, however, soon emerged, and the appropriate treatment was provided, whether it was in-patient, out-patient or at home'.

It was at once clear that the resources of the civil hospitals in Great Britain were altogether inadequate for this enormous problem, and the Ministry of Pensions took over a number of the best-equipped and most suitably-situated hospitals that had been used by the service departments. In addition special clinics were established for the treatment of special forms of disability such as orthopaedic, neurological, tropical diseases, aural, cardiac and ophthalmic. The total number of those receiving institutional treatment rose year by year to 143,388 in 1922, and thereafter declined to a minimum of 7,494 in 1929.

Thirty-seven per cent. of those treated required surgical treatment, and even as late as 1928-29 almost half the cases were surgical. Here the treatment of penetrating wounds of the skull and brain was greatly advanced, and many patients recovered a surprising degree of physical and mental fitness. Gunshot wounds of the chest, often with retained foreign bodies, were also treated with success. In the earlier days where there was a retained bullet or foreign body and the wound had healed soundly, the policy adopted was to leave well alone. In a large number of such cases, however, the wounds flared up after an interval of months or years, and surgical interference became necessary. For this reason the amount of surgical work actually increased considerably from 1919—40 per cent. of all cases—to 1929—45.5 per cent. of all cases, instead of steadily declining, as had been expected.

Some idea of the extent of the supply of artificial limbs and appliances may be gained from the following figures for the years 1920 to 1929:—

Artificial legs ..	95,201
Artificial arms ..	20,079
Surgical boots ..	160,033
Other appliances ..	128,360
Tricycles and invalid chairs ..	5,466
Artificial eyes ..	51,342
Spectacles ..	35,064

The treatment of cases of tuberculosis was in general handed over to the Ministry of Health, but for some years the Ministry of Pensions kept 200 beds in its own hospitals continuously occupied with such cases. An account of this work was given in the *Lancet* in 1924 (Vol. I, p. 1195). Approximately 6,000 cases of mental diseases were dealt with—most of them being boarded out as 'service patients' with special privileges in the country and borough mental hospitals. Cases of neurosis and psychosis, it was found, responded far better to institutional treatment by occupational therapy, and medical and psychological treatment, than if treated at their homes or in general hospitals. A special hospital of 300 beds was opened for the treatment of epilepsy; it was found that many cases labelled 'epileptic' were really cases of some other or of some functional disorder. The magnificent work done in the plastic surgery of wounds of the face at Queen's Hospital, Sidcup, is well known—2,944 facial reconstruction operations were carried out. A special ward was maintained for the treatment of diabetics by dieting and insulin. The care of the blind was entrusted to St. Dunstan's in London, and its sister organisation, Newington House, in Scotland. Lip-reading classes were maintained for the deaf, and many men attained remarkable proficiency. Dental defects were chiefly dealt with by engaging the services of dental surgeons in private practice under whole-time supervisors.

The 'peak' period of treatment activities was reached in 1921 when, in addition to the use of such accommodation as could be secured in military and civil hospitals throughout the country, 113 medical institutions directly under the Ministry of Pensions provided bed accommodation for 18,603 patients, together with the following special clinics—

for surgical cases	..	..	319
tropical diseases	..	..	61
neurasthenia	..	..	48
aural cases	..	..	36
ophthalmic cases	..	..	24
cardiac cases	..	..	19

'In summary', write the authors, 'it is seen that, ten years after the war, the total cases of serious disablement still remaining are, to the extent of 81.5 per cent. composed of only five main disabilities, namely, wounds, tuberculosis, respiratory diseases, organic diseases of the heart and psychosis, of which wounds are rather more than half'.... 'In the aftermath of war, as judged by the award of pension, it is the diseases of lungs and heart and brain which remain the most conspicuous items in the sum of the state's aggregate liability, whilst the wounds, despite their greater numbers, have relatively healed'.

* * * * *

Major Mitchell and Miss Smith are to be congratulated on the publication of this most valuable work. It is full of important lessons for the military medical services throughout the British Empire.

Medical News

ALL-INDIA MEDICAL LICENTIATES' CONFERENCE*

THE twenty-fifth sitting of the Jubilee Session of the All-India Medical Licentiates' Conference will be held at Darbhanga from 3rd January, 1932, under the presidency of Dewan Bahadur T. Rangachariar, C.I.E., M.L.A. The Scientific Section which will hold its sitting on the 4th January, 1932, will be presided over by Lieutenant-Colonel L. Cook, C.I.E., M.B., F.R.C.S., I.M.S., Inspector-General, Civil Hospitals, Bihar and Orissa. The proceedings of this section will be very interesting indeed as eminent persons from different provinces will be coming to read papers on scientific

*This conference has, of course, now taken place; however, we publish the notice in case it may interest any of our readers.

This notice was posted to us on December 6th, that is to say, two days after our January number had gone to press. In special circumstances we send extra matter to press at a later date, but had we sent this notice it would still not have appeared until after the conference had taken place.

We take this opportunity of pointing out to secretaries of societies and conferences that if they wish to secure the proper publicity for their meetings and conferences they should send out notices at a much earlier date, at least three months before the conference when sending notices to monthly journals.—EDITOR, I. M. G.

subjects and participate in the discussion that will follow thereafter.

The objects of this conference are as follows:—

(1) To promote scientific knowledge amongst the members of the class by exchange of thoughts and discussions in the conference; and also to keep them in touch with the most modern system of medicine and researches which are progressing and developing by leaps and bounds every day.

(2) To help towards better relationship, to maintain the honour, and to promote the interests of the class in particular and the profession in general.

(3) To facilitate moral, material, and social progress.

(4) To inculcate *esprit de corps*, and to initiate, promote and identify ourselves with any measures concerning public health, medical services, and medical education in the country.

A scientific exhibition in this connection has also been arranged. Important firms like the Bengal Immunity, the Bengal Chemical and Pharmaceutical Works, the Scientific Apparatus and Chemical Works, Agra, and the Galleno Pharmaceutical Works, etc., are coming with their products for exhibition. This exhibition is expected to be presided over by Hon'ble Sir Ganesh Dutt Singh, Minister-in-charge, Portfolio of Medicine, Bihar and Orissa. We propose to organize a child-welfare exhibition also, including a maternity and a baby show. We only hope that the whole function will be a success and request the scientific as well as the lay people to make a point of attending this conference, which is expected to be extremely valuable from an educational standpoint, and to contribute to its success by their presence.

THE NINTH ALL-INDIA CONFERENCE OF MEDICAL RESEARCH WORKERS

THE following resolutions were passed unanimously at the conclusion of the ninth All-India Conference of Medical Research Workers, held at Calcutta in December 1931, under the auspices of the Indian Research Fund Association:—

1. That this Conference learns with regret the decision of the Governing Body, I. R. F. A., not to proceed with the completion of the formation of the Cholera Commission on account of the present financial stringency. The necessity to India of such a Commission is immediate and paramount, not only in respect of prevention of cholera in Indian populations, but also in connection with pilgrim traffic and many important international questions connected with cholera. The League of Nations, the Office Internationale d'Hygiene Publique and medical opinion in Europe, Asia, America, Australia and Africa had been looking to the early formation of such a Commission to throw light on the important unsolved problems of cholera. Further, it was everywhere recognized that India was the most suitable place for the work of such a Commission. The Conference wishes to record very strongly its opinion that a Cholera Commission should be formed at the earliest date possible.

2. This Conference notes that owing to retrenchment in the I. R. F. A. budget the activities of the Malaria Survey will necessarily be seriously curtailed, since, in addition to other economies, this has involved the keeping in abeyance of two research posts and that of a malaria engineer on the sanctioned staff.

Apart from the requirements of research, the Conference considers that it is imperative to meet demands for officers to undertake inquiries such as have been called for in the case of Bombay, Delhi, the Andamans, Sind and recently Calcutta. The Conference thinks that in this connection curtailment involving reduction in the staff of the Survey to the extent noted above will seriously prejudice the requirements of Public Health in India. It therefore recommends that the question of early re-establishment of the Survey at its sanctioned strength be seriously considered by Government.

3. (a) The Conference wishes again to emphasize the great importance of adequate provincial organizations for the investigation and control of malaria, and hopes that, where they do not already exist, the formation of such organizations will be taken up by Provincial Governments at an early date. It was not the intention in last year's resolution of the Conference that provinces should necessarily await the formation of the Central Malaria Committee before forming such organizations. The Conference has heard with satisfaction of the recent formation by the Assam Government of a Provincial Malaria Organization.

(b) The Conference understands that the formation of a Central Malaria Committee on the lines advocated in Resolution 2 of last year's Conference is under the consideration of Government. The Conference hopes that such a Central Malaria Committee will be formed at an early date and recommends that, if possible, it should meet immediately after the next All-India Conference of Medical Research Workers.

4. With reference to a recent request from the Government of Bengal to the Government of India and from the latter to the Governing Body, I. R. F. A., regarding malaria in Calcutta the following resolutions were passed after full consideration of the question by the Sub-committee on Malaria to which the subject had been referred.

(a) The Conference is of opinion that the questions of the prevalence, causation and control of malaria in and around Calcutta are in urgent need of complete investigation and recommends that such an investigation should be carried out by Major Covell, Officiating Director of the Malaria Survey of India, provided his services can be made available.

(b) The Conference does not think that any useful decision as to the cause of the increased prevalence, if any, of malaria in Calcutta, is possible until the relevant facts have been ascertained by a detailed investigation.

(c) The Conference considers that in the first place the period of investigation should be for not less than one year and that it should commence as early as Major Covell's services can be arranged for.

(d) The Conference considers that the most advantageous method of procedure would be for Major Covell to be given the power not only to investigate, but at the same time at his discretion to initiate actual preventive measures, and also to engage such staff as he may find necessary at any time during the course of his investigation.

5. This Conference is of opinion that the extension of the cultivation of cinchona, the selection of the best species and the cheap sale of cinchona products are of fundamental importance for the relief of malaria in India. It draws attention to the recent findings of the League of Nations Health Committee on cinchona cultivation and 'Totaquina' and requests the Government of India to review their present cinchona policy after a thorough investigation by a committee to be appointed by them.

6. This Conference wishes to record its regret that reduction in the annual grant of Government to the I. R. F. A. has made inevitable the closing down or curtailment of many existing enquiries and the almost complete abandonment of new lines of research, such as that on respiratory diseases, which are responsible for a large proportion of the mortality of the people of India.

The Conference whilst accepting, as it must, the necessity for such reduction in medical research activities is of opinion that the importance of medical research to India cannot be exaggerated and should be seriously appreciated by Government and that the earliest possible occasion should be taken by Government to restore to the Association in part or in full its usual grant.

7. This Conference notes with regret that owing to financial conditions research in plague has been seriously curtailed. As a result of recent work it is evident that important results are being obtained and the further

progress of the work is hampered by lack of funds. In view of the importance of the disease to India the Conference urges that grants for further work on plague, particularly in the field, should be made available as soon as possible.

8. This Conference regrets that it has not been possible in consequence of financial stringency to extend research on nutrition as recommended by the Royal Commissions on Agriculture and on Labour. The Conference is of opinion that the study of nutrition in relation to the health and disease of the people of India is of fundamental importance and that every possible effort should be made to preserve the integrity of the existing nutrition unit and to extend its usefulness.

Current Topics

Chronic Appendicitis

By E. R. NOBLES, M.D.

(Abstracted from the *New Orleans Medical and Surgical Journal*, Vol. LXXXIV, No. 1, July, 1931, p. 13)

IN presenting this subject for your consideration and discussion I will only attempt to touch upon the more prominent features of this disease. My effort will be to correlate the few basic facts that might be helpful in the problem of its diagnosis and management.

Recently certain observations have been noted and brought to our attention which seem to indicate that from forty to fifty per cent. of the operations for chronic appendicitis find the patients unrelieved of their symptoms. These figures are calculated to disturb the hitherto complacent attitude in the matter, and represent a challenge to us that they be improved.

The causes of the poor showing are admittedly diagnostic, and insufficient exploration at the operating table; and I will therefore give these two propositions chief consideration in the body of the paper.

No one has yet risen to deny the fact that the acute appendix is the most criminally inclined of all the organs in the abdomen, and if permitted to remain after an attack it becomes a liability to the possessor, either directly or indirectly, in future gastro-intestinal troubles. Indeed, there is strong doubt in the minds of many that if after becoming acutely infected it ever entirely recovers.

We know that this organ has anatomy, histology and physiology similar to the remainder of the gastro-intestinal tract in every detail, with exceptions only in that it has an abundance of lymphoid tissue implanted between the mucosa and submucosa in early life, a blood supply out of proportion to its size, and a narrow lumen.

That it has a minor part in the final digestive processes is accepted, and through its nerve supply it is intimately connected with the other organs of digestion. This is why a disturbance in it may be registered in any of them, but particularly because of this innervation, epigastric discomfort is the most common referred symptom.

In the realm of pathology so far as its chronicity is concerned there is much still in dispute, for there seems to be no common opinion, and much uncertainty exists among able pathologists and clinicians as to what this term chronic appendicitis is meant to imply.

There are those in high places whose opinions are worthy of respect, who maintain there is no pathologic basis for this disease and that it is wholly a myth. There are others of equal rank who insist that it is a left over from a previous acute inflammation; an end-result rather than an active process.

Others insist that the pathology represents a manifestation of general abdominal disease of which the appendix is only a part and offer this as a reason why in certain cases removal of the appendix or gall bladder, or both, does not relieve the symptoms.

However these opinions may be, there is abundant evidence from other equally notable investigators that the organ can, and does, become affected chronically and that the condition is often seen as a continuing pathological process confined exclusively to the appendix.

One suggestive evidence of this is the rapid pathological change, in some cases overnight, from the initial pain, in an acute attack, to gangrene, perforation and adhesions, with no history of a previous involvement. I can reconcile this observation only with the idea that it was an acute attack superimposed upon an already chronically-diseased appendix. There are those who believe that in all cases it is the chronic change which provides the soil for the acute infection.

This is of interest chiefly from an academic viewpoint, but those who admit its physiology and proneness to acute infection, and then deny to it the pathology incident to chronic change, are making of this organ a unique one within the system.

We know that it exhibits chronic change in the presence of the tubercule bacilli, that it becomes affected with carcinoma and actinomycosis, that it has lymphoid tissue similar in many respects to the tonsil, an organ and tissue frequently affected chronically.

It is therefore conceivable that a slowly-acting bacterial irritant could find favourable ground here for growth and development, and if drainage becomes interfered with through a partial blocking of the lumen by concretions, faecoliths or foreign bodies, and through kinks or twists by its becoming adherent to adjacent organs from an extraneous infection.

It would then require no wide stretch of the imagination to assume that a balance could be struck here as elsewhere in the body between invader and defender, serving as a focal point from which infection may spread, or to produce mild toxic symptoms resulting ultimately in a fibrous degeneration with the possibility of the appendix becoming adherent to some distant organ.

We also know that there is a likelihood of the discrepancy between the pathological findings and the clinical symptoms persisting, inasmuch as the appendix can remain symptomless and exhibit any or all of the pathological changes claimed for it; or continue to produce symptoms with none of them demonstrable.

There is another source of confusion in trying to fix a certain group of symptoms, upon one organ and naming the disease chronic appendicitis, when as a matter of fact many times other ætiologic factors are involved in the production of these, and occasionally the disturbance that originated in the appendix is no longer dependent upon it by the time the patient presents himself for examination.

A pathologic picture and a clinical picture would not therefore indicate the same thing. As clinicians we are interested in this because of its bearing upon the multitude of symptoms frequently presented even by one patient for differentiation and it serves as a warning to the numerous pitfalls in making the diagnosis.

That the symptoms of this disease may be local, referred or general is a natural assumption when the application of the knowledge of its pathology has been made, but if there should be a demand for an orderly array of symptoms upon which to base the diagnosis it would be impossible to supply them, except to state that they are characterized by their irregularity as compared with signs of other abdominal disease.

It might be said that for the most part these patients suffer from stomach trouble, pain, local tenderness as a rule, gas distress and indigestion; and that these symptoms may be due to three types of derangement, namely, mechanical interference with the intestines as a result of stasis, reflex disturbance manifested chiefly by pyloric spasm, and toxic absorption from the appendix exhibited by the systemic signs that are often prevalent.

The objective signs are concerned chiefly with the abdominal reflexes, many of which are extremely unreliable. Morris suggests that resonance in many

cases is more pronounced on the right side as compared with the left side, and insists that this is due to a continued distention of the cæcum and ascending colon caused by innervation fatigue reflected from the chronically irritated appendix.

The history of one or more acute attacks, while greatly helpful, but which may require the talent of a detective to uncover, is not absolutely essential to the diagnosis, and to try to avoid it unless such a history is obtainable is untenable as Larimore has recently stated for four reasons:—

1. That an acute attack is certain of diagnosis.
2. That later it may be definitely diagnosed from its history.
3. That a history of an acute attack can with certainty be brought out.
4. That chronic appendicitis is without exception a residual disease.

But in the absence of a history of an acute attack, either recent or remote, the diagnosis is made purely on circumstantial evidence, which our legal friends tell us is the best evidence obtainable if it can only be made strong enough, but in fixing guilt upon the appendix, I think the safest ground always is to assume its innocence until after all the possible complicating elements are thought of and ruled out in an honest and intelligent manner, giving especial consideration to those conditions that an abdominal section will not relieve, and in which such a procedure might prove harmful.

There are many of these that are relatively unimportant but should be thought of, and of the more important ones doubtless first place is taken by the neuralgias, intercostal and costo-lumbar, given prominence by the recent work of Carnett and Boles; and their method of differentiating intra-abdominal and parietal tenderness is of value and should be used if there is any suspicion of neuralgia in the lower intercostal nerves.

Pyelitis, right sided, and kinks or twists in the ureter on the right side should be given consideration, if often requiring cystoscopy, ureteral catheterization, and pyelography intelligently to rule these out.

Arthritis of the spine, sacro-iliac strain, intestinal worms in children, afebrile and atypical malaria of the æstivo-autumnal type, tuberculous glands in the right iliac fossæ all should be eliminated by measures appropriate to each.

The viscerotonic with a pain in the right side due to the drag on the appendix and cæcum should generally be treated medically, watching especially for the type who presents a general constitutional asthenia, associated with a mucous colitis and ileal stasis.

The surgical lesions most often confused with, or mistaken for chronic appendicitis, are chronic peptic ulcer and chronic cholecystitis, and undoubtedly in many of these cases the distinction is impossible. Certainly in some cases a dual or even a triple diagnosis, while not so classical, comes nearer meeting the diagnostic problem.

The lymphatic drainage from the appendix and the possibility of transfer of infection through the portal system to the liver encourages the belief that a chronically damaged appendix is often primary to gall bladder infection.

I believe in these cases the greatest single help comes from a complete and discerning history, emphasizing especially the influence of food upon the pain and epigastric distress generally present and the kind of food causing the most discomfort.

The next step is a well-conducted physical examination of the abdomen, in which, of course, the personal equation plays a large part. A radiologic survey of the entire gastro-intestinal tract which should include cholecystography is certainly indispensable in many cases, though in offering indirect rather than direct evidence of disease in the appendix. Contrary to the opinion of some patients the radiologist should not be expected to make the diagnosis and direct the treatment.

The diseases next to be distinguished because of their frequency are those of the right uterine appendages.

which usually can be ruled out by the history of accentuation at the menstrual time, or by a vaginal discharge, together with a pelvic examination. A retroverted uterus will not infrequently cause pain in the right side due to the strain on the attachments of the cæcum and appendix, either because the prolapsed cæcum is hanging on them or the ovario-pelvic ligament is pulling on them.

A mobile tender cæcum with, or without, coloptosis, if associated with ileal stasis can usually be determined by the radiologic examination.

Incipient hernia should be thought of when confronted with pain in the right side, and other conditions are a mild chronic pancreatitis, carcinoma or tuberculosis of the cæcum, tuberculosis of the peritoneum, chronic diverticulitis and early psoas abscess, as well as certain abdominal adhesions.

Of these but few can be diagnosed with any degree of certainty except by inspecting and touch, so when the diagnostic problem is reduced to these we might well observe the dictum 'when in doubt operate'.

Chronic appendicitis in children has not been given the attention that it justly deserves, and the lesion should always be suspected when there is a history of listlessness, a capricious appetite, colicky pains at irregular intervals, with at times nausea and vomiting.

If in addition there is a statement that the child cannot bear anything firm around his abdomen such as a belt, or seems to avoid rough games because of probable injury to the abdomen and the examination reveals tenderness over McBurney's point, we may be reasonably assured that it is a case of chronic appendicitis.

The diagnosis of this disease, as I have attempted to show, should in most cases represent the sum total of a careful clinical, physical, radiological, and laboratory examination, judged conservatively with proper appraisal of each, for none of the symptoms and findings have unequivocal value.

Undoubtedly in a large number of cases of chronic appendicitis seen early or before this low grade infection has caused damage in other organs, when the appendix is acting simply as a local irritant, or perhaps a point of focal infection, or from which are coming mild toxic symptoms, simple removal is followed with splendid results.

In another type when there is a definite pathology in the appendix but in addition adhesions about the cæcum, perhaps Jackson's membrane or probably Lane's kink with or without a ptosis of the cæcum and colon, simple removal and the severance of adhesions and a fixation or plication procedure best suited to the conditions found in the ptotic cæcum or colon is followed with good results in all cases except those followed by formation of new adhesions unfavourably located for good bowel function.

A third type is that in which there is no evident pathologic change in the appendix beyond an obliterating appendix, but the damage has passed on to the gall bladder, stomach, or other abdominal organs. Simple removal in these cases, unless accompanied by proper surgery to the other damaged organs, will in a very short time be followed by a recurrence of the symptoms.

A fourth type is that in the nervous patient, or in the visceroptotic, or the one who is passing or has passed into a state of chronic invalidism, when the kinked, twisted, adherent or obliterating appendix is only one episode in the general disablement, and it is in these patients in whom surgery alone does not meet the full therapeutic programme, for they need additional care, dietary, hygienic, orthopædic may be, and often mental and social.

Certainly it requires keen judgment in many of these to determine whether surgical or mental treatment should be the first instituted.

Conclusions

In conclusion I will say that this paper on so important a subject is necessarily sketchy. It is

intended as a sort of commentary on the salient features of this disease.

One hope was to stress such features as would emphasize the dangers lurking in the fetish of pain in the right side as direct evidence of chronic appendicitis. That it is imperative to go about the diagnosis, not by a poke in the side followed by a conclusion, if there is a history of indigestion; but in a methodical manner before and not after the appendix is removed, if our results are to be improved.

To beware especially of the neurotic with many pains distinguished by the multiplicity of their sites and the variety of their types, in whom if a diligent search be made will be found other evidences of the stigmata of decline.

Also the type common enough who seem to be all right except for the intimacy existing between the cerebral cortex and the right iliac fossa.

That it is essential to distinguish the surgical from the non-surgical lesions that might be mistaken for chronic appendicitis, and that once an operation is decided upon, unless a long enough incision be made to inspect with the least amount of traumatism all the abdominal viscera, the patient has had inadequate surgery.

Injuries and Fractures of the Skull

By L. R. BROSTER, O.B.E., D.M., M.Ch., F.R.C.S.

(Abstracted from the *Practitioner*, Vol. CXXVII, No. 1, July, 1931, p. 64)

Head Injuries

THERE is probably no subject in which the diagnosis and treatment are more dependent on the accurate interpretation of the pathology and knowledge of the various clinical types, nor one in which the anxieties and responsibilities of the practitioner are more severely taxed. The lay mind has, so far, not sufficiently realized the unpleasant sequels which may follow in the train of these accidents, even the most trivial. These should always be explained to the relatives or friends, in view of the compensation and litigation which invariably follow. The public is apt to focus its attention on the actual fracture, rather than the more important consequences to which it gives rise.

Physical conditions.—There are several peculiarities in the anatomical arrangement of the head which it is necessary to consider as an introduction to the subject, and no article can be complete in this respect without reference to Trotter's work.

The brain is surrounded by an inextensible capsule, the dura mater, and is contained within a rigid box, the skull. It lies in a natural bed of cerebro-spinal fluid, which bathes both its internal and outer surfaces. This fluid, secreted by the choroid plexuses of the lateral ventricles, passes down the narrow channels through the third and fourth ventricles, and, escaping at the base of the brain in the region of the fourth ventricle, it spreads out over the surface of the hemispheres to be absorbed into the large venous sinuses through the Pacchionian bodies. Some of this fluid also passes down through the foramen magnum to bathe the spinal cord and nerve roots. The pressure of the cerebro-spinal fluid is low and runs *pari passu* with the pressure within the larger venous sinuses. The brain itself must be regarded as a sponge permeated by three zones of pressure. A zone of high pressure imparted by the narrow arterial inlet with a pressure corresponding to that of the systolic pressure within these vessels. This pressure gradually falls as the arterial channels divide and widen out to form the capillaries, and finally reaches a low ebb as the blood passes into the larger veins and into the capacious outlet of the venous sinuses. As the brain cannot expand, any encroachment on the intracranial space is strictly limited to the displacement of a small amount of cerebro-spinal fluid down into the cord and a small amount of blood from the veins into the sinuses. Any increment to

this encroachment will cause profound disturbances to the intracranial circulation.

The forces concerned with the production of a head injury are twofold: (a) the external violence applied to the skull which is momentary, and (b) the effect of such violence on the intracranial contents. The first effect of violence is to cause deformity, i.e., the skull is flattened out and will bulge at right angles to the point of application of the force; when its limit of resilience is reached, it will crack, usually in the form of fissures running down to the base in a parallel direction to the compressing force. The moment the force has ceased to act, it will recoil and recover its normal shape. As a result of this sudden general pressure, the brain is momentarily squeezed, and, on the analogy of the sponge, after its normal capacity for encroachment has been passed, the blood vessels are emptied and a condition of acute cerebral anæmia is established. Whereas the recovery of the skull is instantaneous, the reflow of blood and the secretion of cerebro-spinal fluid into the brain is a more gradual process and recovery is slow. These must be regarded as the changes which are intimately concerned with the production of concussion. Apart from these general effects, the brain may be bruised at the point struck, the so-called 'direct contusion', or by means of a wave of repercussion against the skull diametrically opposed, the so-called 'polar contusion' or 'contre coup'. Although the dural septa tend to dissipate these forces, evidences of the path of this wave remain as small and scattered areas of contusion within the brain substance.

As the result of trauma, the brain space may be encroached upon by means of such internal agencies as hæmorrhage, œdema, air, foreign bodies, and, in the later stages, sepsis. This pressure may be general or local in its effect upon the brain substance and leads to an embarrassment of the intracranial circulation. The effects of local pressure are those of cerebral disease generally, but are rarely encountered in these cases. The first effect will be the production of a zone of venous compression in the brain beneath it. Further increase in this pressure will produce, in addition, a deeper zone of venous obstruction. The tissues in this zone will be subject to a state of relative anoxæmia, and this would give rise to such symptoms which are associated with cerebral irritation. Any further increase of the pressure will produce a still deeper zone of capillary compression, and the symptoms associated with such arterial anæmia are coma and paralysis.

Symptoms

Concussion.—Concussion may be defined as a temporary suspension of the cerebral function following immediately on an injury and lasting a variable time with recovery in twenty-four hours. It follows directly on a sudden compression of the brain with displacement of cerebro-spinal fluid, the loss of consciousness and flaccid paralysis being due to cerebral anæmia. Recovery begins from the medullary centres upwards, usually initiated by the reflex act of vomiting, and the other cerebral functions recover more gradually. There is complete amnesia for the period of unconsciousness. It is important at this time for the patient to be under skilled and competent observation. Following concussion, there is a lucid interval, during which time the patient becomes mentally rational, but it may be so transient as to pass unnoticed, and the patient may pass directly into coma either from severe cerebral compression or damage to the bulbar centres.

Cerebral contusion.—There has been a good deal of ambiguity with regard to the various clinical conditions which constitute 'cerebral irritation'. So, for purposes of clearer description, it is advisable to follow the classification adopted by Symonds, of major and minor contusions.

Major contusion.—This presents a picture of a patient who is stuporose, restless and irritable. It follows on an injury sufficient to cause concussion from which the patient recovers after a variable time, and passes into a state of stupor. He lies curled up in bed. At times

he is difficult to rouse, and at other times resentful of interference, noisy, disorientated and violent. This condition may persist for weeks with alternating periods of lucidity and clouded consciousness, of which there is amnesia, a condition to be distinguished from the complete unconsciousness of coma. Lumbar puncture will reveal increased pressure, as registered by means of the spinal manometer, and blood may be present in the fluid.

Minor contusion.—Minor contusion is characterized by headache, giddiness, and mental disability. This condition may arise after an injury with or without concussion, or follow as a sequel from major contusion. In the former, it follows directly or may be delayed for several weeks. Headache is generally intermittent and referred to the site of injury, although at times it may be continuous with exacerbations. It is markedly affected by posture and by alteration of posture, physical exertion and mental stress, and is often aggravated by lying down. Giddiness is similarly affected by changes of posture. Mental disability, such as defective memory, inability to concentrate and indecision may occur, and is often associated with insomnia. In either form of contusion, focal symptoms are rare and their localization is of cerebral disease generally, although they may be the origin of such conditions as permanent mental change and epilepsy. The latter are usually of the Jacksonian type, and in the early stages may be in the nature of a passing symptom, though their later appearance is of a more serious and permanent nature. Meningitis, cerebral abscess, and chronic sub-dural hæmatoma are liable to follow head injury at a much later date.

Compression.—The principal features of compression are coma and paralysis, unequal pupils, stertorous respiration, slow pulse and high blood pressure. It indicates a progressive interference with the intracranial circulation, generally from hæmorrhage. The hæmatoma is always a local lesion and affects one part of the brain more than the rest, consequently it can give rise to clinical symptoms varying according to its situation. In the early stages, according to our pathological dicta, the symptoms will be those of irritation—venous stasis, and, later, paralytic—due to anæmia from capillary compression, and these symptoms may coexist as one part of the brain is more affected than the other. It is convenient to tabulate these symptoms, briefly, as they affect the hemispheres, mid-brain and medulla:—

	Irritative.	Paralytic.
<i>Hemispheres</i> ..	Irritability, stupor, restlessness.	Coma.
<i>Motor cortex</i> ..	Jacksonian fits	Hemiplegia. Hemiparesis.
<i>Mid-brain</i> ..	Contracted pupil	Dilated and fixed pupil.
<i>Medulla</i> ..	Vomiting	.....
<i>Respiration</i> ..	Slow stertorous breathing.	Shallow irregular respiration.
<i>Cardia</i> ..	Slow pulse	Rapid weak pulse.
<i>Vasomotor</i> ..	Raised blood pressure.	Falling blood pressure.

Bulbar symptoms are evidence of advanced compression and are always of serious import.

Signs of fracture of the base of the skull.—For clinical purposes it is convenient to classify fractures into those of the anterior, middle and posterior fossæ, and correlate with each of them the signs of fracture, which are:—(1) Escape of blood; (2) escape of cerebro-spinal fluid and brain matter; (3) injury to nerves; (4) infective conditions.

Symptoms.—The main symptoms are as follows:—

Anterior fossa: Escape of blood and cerebro-spinal fluid into the nose, which escapes externally or is swallowed, bleeding into the orbit causing bruising of the lids—'black-eye', sub-conjunctival hæmorrhages and proptosis. The olfactory and optic nerves are both liable to injury. Infective complications, meningitis

or abscess may follow, whether the frontal sinus is involved or not. *Middle fossa:* Leakage of blood and cerebro-spinal fluid into the mouth and through the external auditory meatus. The sixth and seventh nerves are commonly injured, and to a lesser degree the eighth. Otitis media is apt to follow rupture of the tympanum, and sepsis may spread through the fracture giving rise to extradural abscess, meningitis and cerebral abscess or sinus thrombosis. *Posterior fossa:* Leakage and bruising under the muscles of the back of the neck. Injury to the seventh and eighth nerves, but the ninth, tenth, eleventh, and twelfth are very rarely involved. Infection is uncommon.

Treatment

The surgical treatment of head injuries, apart from the early disinfection and excision of compound injuries for limitation of the spread of sepsis, concerns mainly the relief of intracranial tension from whatever source. All cases should be put to bed at once under expert nursing after thorough and repeated neurological examination.

Concussion.—In a case of simple concussion recovery will invariably be complete within twenty-four hours. It is necessary to warn the patient, or his friends, that a period of three weeks' complete rest is essential, and that the return to normal life should be gradual. The liability to subsequent headaches is often determined by the thoroughness to which this regime has been adhered. This headache may be so severe and persistent as to necessitate decompression at a later date. Direct surgical treatment during the first twenty-four hours of concussion is called for only by the onset of coma and paralysis after a lucid interval.

Major and minor contusion.—For this condition, rest in bed, preferably in the sitting position, and sedatives are indicated. The intracerebral disturbances in these cases are due to increased tension, and the amount of this tension can be measured and controlled by the spinal manometer. Treatment should be directed to the reduction of this pressure. When it is slight, mag. sulph. daily by mouth will suffice. In severe cases the choice lies between mag. sulph., 3 oz. in 6 oz. of water per rectum, or hypertonic saline, 50–100 c.cm. of 15 per cent. solution, administered intravenously and repeated if necessary every two days.

A more rapid effect can be produced by means of lumbar puncture, and by drawing off enough till the spinal pressure reaches normal, and repeating if necessary. When symptoms such as maniacal delirium are protracted, sub-temporal decompression, in non-localizing cases, affords a more rapid resolution of the cerebral oedema and means of escape for the surface hæmorrhage. For unrelieved contusion headache, decompression offers good help for recovery. The onset of the same symptoms after the first twenty-four hours is indicative of a late arterial hæmorrhage, or the formation of a sub-dural hæmatoma.

Compression.—For compression operation is the only treatment available, and it is more successful when performed in anticipation, i.e., before compression sets in. It not only allows removal of the hæmatoma, but provides an exit for further oozing, for the ligation of any bleeding vessel, and relieves the tension produced by oedema and contusion.

Within the first twenty-four hours, concussion obscures the true pathology, but if after partial or complete recovery from it, the patient sinks into coma or paralytic symptoms develop, arterial hæmorrhage is almost certainly present. The hæmorrhage may be extradural, sub-dural, intracerebral or intraventricular, and it may gravitate below the tentorium or it may be bilateral. Extradural hæmorrhage is nearly always in the middle fossa from laceration of the middle meningeal artery, and is more likely to be associated with a well-marked lucid interval following concussion. Of the others, sub-dural hæmorrhage is the commonest; the lucid interval is usually of shorter duration, and irritative symptoms predominate. Blood may be recovered in the spinal

fluid. Intracerebral, intraventricular and bulbar hæmorrhage are always of serious import.

Where the symptoms are not localizable, sub-temporal decompression is the operation of choice, but in the case of gross injury with no local signs and evidence of bulbar involvement, sub-tentorial decompression should be performed.

Where there are definite localizing signs, such as, for instance, Jacksonian fits, decompression should be performed over that particular area. As a rule, it is better to remove the bone in such cases rather than perform an osteoplastic flap. In all local lesions with depressed fracture operation is necessary. As most of these cases are infected, the wound should be disinfected and the dura incised.

Chronic subdural hæmatoma, even after trifling injury, is a late sequel of head injury, and is often mistaken for tumour. The presence of xanthochromia and fibrin in the cerebro-spinal fluid is diagnostic. It must be remembered that the hæmorrhage is often bilateral. The possibility of sepsis should always be considered, and its presence some distance away from the focus of infection must not be forgotten. Its prevention depends on the thorough disinfection of the wound and accessory passages when involved in the injury. The symptoms of intracranial extension are latent, and the presence of polymorphonuclear cells in the cerebro-spinal fluid is indicative of commencing meningitis. Later, the protein content may be increased, and it is not necessary to wait for the presence of organisms. Decompression and drainage should be performed over the area, including the route of infection if originating from the middle ear or frontal sinus. Very rarely is it possible to remove a chronic thick-walled abscess intact.

Burns and Scalds

By ERIC I. LLOYD, M.B., F.R.C.S.

(Abstracted from the *British Medical Journal*, 1st August, 1931, p. 177)

BURNS AND SCALDS are classed together because their lesions are similar, but it is a matter of general observation that scalds are a good deal commoner than burns. Donald analysed the London Hospital's figures for the last thirty years and found that the percentage of scalds in the total number of deaths from the combined causes shows a tendency to increase and is now in the neighbourhood of 70. We are thus still faced with a considerable death roll which no doubt is largely made up of young children. Although legislation and social improvements may continue to restrict the number of burns it seems likely that the wastage of child life from scalds will continue so long as the teapot and kettle exert their fascination on youthful minds.

Burns and scalds have always been looked upon as dangerous accidents, but it must have surprised many to learn from Fraser's Edinburgh series published in 1926 that the mortality was 38.7 per cent. in children under 10 years old admitted to hospital. Prognosis depends upon the area burned and the age of the patient more than upon the depth of the burns. Involvement of 12 per cent. of the body surface may end fatally but an even smaller area has caused death in the very young.

The immediate effect of a burn is to produce shock and this may be the direct cause of death. The clinical picture in no way differs from shock due to other causes, and its effects are due to stagnation of blood in the capillary system throughout the body and a consequent profound fall in blood pressure such as occurs in fainting. When death follows it is consequently death from a physical mechanism. The stage of shock lasts for a variable time and is sometimes surprisingly slight after severe injuries. In the course of some hours, or it may be a day or two, the patient who survives enters a state of toxæmia or else passes on to recovery.

Toxæmia may follow with quite dramatic suddenness at a time when things seem to be going well. The temperature rises to perhaps 104°. the pulse frequency is

increased, restlessness supervenes and passes into unconsciousness and death. It has been shown by experiment that this remarkable condition depends upon absorption of certain poisonous substances from the burned area. These substances are proteins and amongst them is histamine. Death from toxæmia is consequently death from a chemical mechanism, in contradistinction to the physical process which brings about death in the stage of primary shock. These facts must be remembered when we come to treat the two conditions.

GENERAL TREATMENT

The immediate treatment of a burn or scald is the treatment of shock, and attention should thus be focussed from the outset on the general condition of the patient. Occasionally it may be wise to postpone removal from the scene of the accident for a few hours, and in such instances morphine hypodermically and fluids by the mouth should be generously given. More often the patient can safely be moved to a hospital or institution and this should be carried out with a minimum of attention to the burned area. Anything that can be done to it under emergency conditions is likely to increase shock and the best routine course is to withhold all dressings. In particular the popular linseed and carron oils should be avoided. A burned patient demands so much medical and nursing care that home conditions are rarely ideal for the treatment of such a case. His prime needs an hour or two after the injury are rest, warmth, fluids and morphine. These should all be supplied as soon as possible and two or three hours may often be advantageously spent in this way before attending to the burns. During this time the patient is given a chance to contend with shock and by making haste slowly he will sometimes avoid disaster.

LOCAL TREATMENT

Many different applications have been used in the local treatment of burns, but the introduction of a 2½ per cent. aqueous solution of tannic acid by Davidson of the Henry Ford Hospital, Detroit, in 1925 marks an important step forward.

It was known that the dangerous condition of toxæmia was due to the formation of autolytic products of protein decomposition in the burned area and their subsequent entrance into the blood stream. Tannic acid does what the much-used picric acid tries to do, that is to say it coagulates the damaged proteins and prevents their absorption into the circulatory system. In consequence, the constitutional disturbances are minimized, pain is strikingly lessened and scarring is generally slight. Most important of all, there seems good reason to believe that the mortality is greatly reduced. Details of the method and its results have been fully described by E. C. Davidson and later by W. C. Wilson. It will be sufficient here to give a brief outline of its practical application.

As soon as the patient has made some recovery from the initial shock he is anesthetized with gas and oxygen and the burned area carefully swabbed with ether. Dead and damaged tissue is snipped away with scissors, vesicles are opened and their outer wall removed. A flat, clean surface is thus produced and tannic acid is applied in 2½ per cent. freshly prepared aqueous solution with an ordinary throat spray.

The whole area except the face is thus treated and the patient put back to bed under electric lamps with no other dressing on the burns. The spraying is repeated hourly seven or eight times until the burned area is tanned dark brown. Meanwhile, such toxins as have already entered the system are diluted by copious fluids given by the mouth, rectum, subcutaneously or intravenously.

Subsequent Course after Tannic Acid Treatment

Under this treatment fever and pain subside, the dangerous toxins are locked in a coagulum and the general comfort and well-being of the patient is often remarkable.

If treatment is applied soon after the accident and the toilet has been efficiently performed there may be no

sepsis. Sometimes, however, pus forms underneath the scab and fever reappears. Under such conditions there is a temptation to resort to fomentations or other moist dressings. These are harmful because they release the toxins from the inert coagulum and re-establish the condition of toxæmia which we most want to avoid. The proper treatment at this stage is to liberate the pent-up fluid by cutting channels in the coagulum with pointed scissors and so providing mechanical drainage without moistening the scab. During this time the patient remains beneath the electric light cradle which dries up discharge and maintains body heat.

In about two weeks the coagulum spontaneously separates though it takes longer when the burns are deep. Beneath will be found healthy epithelium or granulation tissue. The latter may be dressed with flavine (1 : 1000) in paraffin or with sterile vaseline, since the danger of toxæmia has been removed with the coagulum.

BLOOD TRANSFUSION

Before the introduction of tannic acid one has seen a timely blood transfusion apparently save life. Robertson of Toronto obtained splendid results by his method of exsanguination-transfusion in which the patient was bled immediately before receiving the transfusion. Though both these methods aim at the dilution of circulating toxins, exsanguination first removes a large amount of toxin and then dilutes the remainder by the blood transfusion.

Prevention is better than cure and it seems reasonable to imagine that if toxæmia can be prevented there will be no need for blood transfusion. Such indeed has been my experience with tannic acid, and though there are still occasions (e.g., in well-established toxæmia) when blood transfusion is a valuable auxiliary method of treatment in burns and scalds, yet nowadays one rarely finds it necessary.

CONCLUSION

In conclusion, I return to our main theme and you will have gathered from my preceding remarks that I regard the introduction of tannic acid as an important event. Perhaps in the past there has been a tendency to forget the excellent adage that we must treat the patient and not the disease. The general treatment of the burned and scalded will always remain of paramount importance and I have failed signally in my task if I have not brought this home to you. It does, however, seem from our growing experience with tannic acid that we have in it a substance which treats both disease and patient, inasmuch as it forms a local application of first-rate efficacy and, when applied early, goes far towards preventing the onset of those calamitous symptoms which we call toxæmia.

The Status Lymphaticus.

(Editorial. Abstracted from the *Medical Journal of Australia*, July 25th, 1931, p. 107)

For very many years it was known that enlargement of the thymus gland is often the most striking pathological finding when sudden death has occurred from apparently insufficient causes. There is a record of such an observation in 1614. In 1830 Kopp suggested that laryngospasm was a true thymic asthma due to pressure of the enlarged thymus on the trachea, great vessels and autonomic nerve trunks. Friedleben in 1858 maintained that pressure of an enlarged thymus could not explain Kopp's *asthma thymicum*, but it was not till 1889 that the term *status lymphaticus* was introduced by Arnold Paltauf. He advanced the view that thymus death is due to a lowered resistance, dependent on a specific constitutional anomaly of a lymphatic chlorotic type which so weakens the influence of the nervous system that persons with this anomaly were unable to withstand shocks or injuries that would not have seriously affected normal persons. The anatomical changes were to him only the gross manifestations of a nutritional defect or

anomaly. These views were accepted by many observers, but there have always been some who have stoutly denied the existence of a *status lymphaticus*. Most textbooks have contained descriptions of a *status lymphaticus*. In Allbutt and Rolleston's 'System of Medicine' a whole chapter is given to the discussion of the condition, but it is stated that it is 'still regarded with doubt in some quarters'.

The existence of a *status lymphaticus* is a convenient and happy explanation for unexpected fatalities, especially when the fatalities follow administration of an anæsthetic and are the subject of a coroner's inquiry. It is quite possible that a diagnosis of *status lymphaticus* has often been made on incomplete evidence in these circumstances. In any case it is obvious that the conception of *status lymphaticus* was based partly on observed anatomical facts and partly on hypothesis. A diagnosis of *status lymphaticus* was not justifiable merely because a thymus, presumably larger than it should be, was discovered. The need for some definite determination on this matter was recognized by the Medical Research Council of Great Britain in 1926. In conjunction with the Pathological Society of Great Britain, the Council organized a collective investigation. A committee was appointed and investigators in large centres of population were allotted the task of collecting records. An analysis of the data has been made and published by Dr. Matthew Young and Professor H. M. Turnbull in the March 1931 issue of *The Journal of Pathology and Bacteriology*. The special objects of the investigation were: (i) to establish by means of a large series of weights and measurements the standards of weight for age and proportion to body weight of the normal thymus at all ages, and (ii) to investigate closely the precise cause of death in persons dying suddenly from unexplained or trivial causes when the only apparent abnormality was the presence of a large thymus. The general conclusion of the committee is that there is no evidence that so-called *status lymphaticus* has any existence as a pathological entity. Medical practitioners who are specially interested in pathological investigations will, of course, study the analysis of the records. In this place it is possible merely to indicate the main features. The average weights of the normal thymus for the several ages for one year upwards and the mean percentage proportions of thymic weight to body weight in the different age groups from one year onwards may be considered to be definitely established. The figures for ages to one year exceeded the corresponding values based on published data from the London Hospital, but the data were not numerically adequate to warrant any emphasis being laid on the differences observed. There was no evidence that acute diseases of short duration (under three days) reduced the average weight of the thymus to an appreciable degree. An abnormally large thymus in itself cannot be considered indicative of *status thymico-lymphaticus* when no obvious cause of death is found post-mortem. The deaths are analysed and many are discussed in detail. In the only case in which it was thought that *status lymphaticus* was responsible for death, the thymus was not significantly large. 'Encirclement of the trachea' by the thymus is comparatively rare in occurrence and is not necessarily associated with a thymus exceeding the average weight. In the normal group (cases of sudden death in apparently healthy persons) there appeared to be little, if any, association between the weight of the thymus and the amount of lymphoid tissue in the various parts of the body. There was no definite evidence of any concomitant general hyperplasia of lymphoid structures when an abnormally large thymus was present. The amounts of lymphoid tissue in the several parts of the body showed practically no association with one another to which any significance could be attached. In the presence of Grave's disease there was evidence that the average gross weight of the thymus was distinctly above the normal. There was no evidence of an association between arterial hypoplasia and an abnormally large thymus.

Although the number of cases investigated was limited to 680, and although right through the published analysis continual reference is made to the relatively small data and so forth, it would appear that the death blow has been given to the belief in the existence of a *status lymphaticus*. The members of the committee are known to be possessed of sound judgment, and Professor Turnbull, who examined the available material, is so highly esteemed as a pathologist that it would be difficult to arrive at any other conclusion, even if the result of the investigation did not bear the imprimatur of the Medical Research Council. The onus must rest on those who believe in a *status lymphaticus*, if there still are such people, to prove its existence. At the same time, while it is an easy matter to say dogmatically that no *status lymphaticus* exists, and to quote this investigation as an authority, no sudden death should be unexplained. More accurate and comprehensive clinical investigation and the wider adoption of post-mortem examinations are the key to many a riddle of this kind.

Reviews

A PRACTICE OF MEDICINE.—By Professor Adolf Strumpell. 29th and 30th Editions by E. Seyfarth, D.Med. et Phil. London: Baillière, Tindall and Cox, 1931. Volumes I, II and III. Pp. xxiii plus 2356, with 17 plates and 392 figures in the text. Price, £5 5s. net

THIS work needs no introduction; it is world-famous. It is now in its thirtieth edition in Germany and it has been translated into English, French, Spanish, Russian, Italian, and Turkish. This is the translation of the last, the 1930, edition.

Adolf Strumpell was a physician of the old school, essentially a clinician; this fact is obvious in every page of the book. The recent revisions of Professor Seyfarth have not altered the character of the book. It is perhaps a question whether conservatism has not been carried too far in places. In the preface to the last German edition Professor Seyfarth offers his thanks for the many suggestions that have been made, both verbally and by correspondence, for the revision of this book, but points out that with some of these requests he has been unable to comply as it is necessary to use considerable discrimination before adding matter to a book of this nature. He has quite rightly avoided adding new theories or new forms of treatment which have not been thoroughly tested and which may be exploded or forgotten in a few years' time. On the other hand we think that perhaps he has gone a little too far in adopting the extremely conservative plan outlined in his preface in which he says 'only those diagnostic and therapeutic measures have been incorporated which I have personally tested and found to be useful', an admirable precaution where one is dealing with a limited subject, but in a comprehensive book of this nature surely it is unnecessary; the adoption of this principle has had a disastrous result in the tropical diseases section of the book. The reviewer feels a certain amount of reticence in criticizing a book which has so many outstanding qualities, but he cannot pretend that he was not bitterly disappointed in the chapters dealing with tropical diseases. Take, for example, sandfly fever; the index says 'Sand-fly fever see Pappataci fever'. Under this heading we read that it is a 'benign infection transmitted by the sting of the pappataci mosquito'. Admittedly only a very small percentage of the 126,000 German, not to mention the English, French, Spanish, Russian and Italian, readers will ever want to know much about this disease, but that small percentage, and a larger percentage of Greek and Turkish readers, will not thank the writer if they rely, at the author's suggestion, on 'mechanical protection' against mosquitoes as a prophylactic measure against sand-fly fever; the reviewer speaks feelingly,

from bitter, personal experience. Even the section on malaria, which is on the whole satisfactory, is disappointing when it comes to the subject of treatment; Plasmochin is given only a few lines, whereas there is more than a page on the value of salvarsan as an adjuvant in the treatment of the disease. The course of quinine advocated is somewhat fanciful and the alkali treatment is not mentioned. (There is an obvious misprint on page 181, where 15 grains for each year of age is suggested as a daily dose for children; poor little devils!)

Despite these few defects it is a book which is particularly suited to the student in this country. The symptomatology, the ætiology, the diagnosis, the prognosis, and the treatment of each disease is dealt with fully and clearly. Wherever illustrations are required, they are used. Many of these are in colour; those depicting skin diseases and rashes are particularly good. In the section on diseases of the chest the skiagrams reproduced will be very useful.

The printing, paper and binding are of a very high class, and the illustrations are excellently reproduced. The price is perhaps on the high side for the average medical student, but for a publication of this quality it could scarcely have been placed at a lower figure, and, as it is not a book which will rapidly become out of date, the student will not have to discard it when he is qualified.

L. E. N.

A MANUAL OF GENERAL MEDICAL PRACTICE.—

By W. Stanley Sykes, M.A., M.B., B.Ch., D.P.H., M.R.C.S., L.R.C.P. Second Edition. London: H. K. Lewis and Co., Ltd., 1931. Pp. xi plus 213. Price, 7s. 6d. net

THIS book is written with several objects in view; to assist the young practitioner in the organisation and conduct of his practice to give him some idea of the difficulties which he may meet and, lastly, to introduce him to what the author calls the 'non-hospital diseases' with which he is but ill-acquainted at the time he passes out from his medical school. Dr. Sykes has something to say on the lack of preparation for general practice which the ordinary hospital training affords and is somewhat resentful, perhaps not unjustly, of the unsympathetic attitude of certain members of hospital staffs who, he considers, adopt an unfair and illogical attitude in criticising the work of the general practitioner while remaining in complete ignorance of the difficulties under which it is performed.

In the purely technical part of the book the author has omitted such matter as is to be found in textbooks, but gives notes and hints on those diseases which are most commonly met with in practice. These chapters are too short to include anything but a series of somewhat disconnected reflections, but there are many practical points from the author's own experience which are worthy of note. We would venture to suggest that figures showing the results of serum treatment in diphtheria with a dosage as low as from 6,000 to 8,000 units are hardly representative, and that the somewhat cursory remarks on the results of vaccine treatment are open to objection.

A chapter on midwifery includes a useful list of those instruments which form the essential equipment for the treatment of normal or ordinarily-difficult cases. Here, as in other sections of the book, the author again offers a convincing defence against the casual and frequently-undeserved criticism to which the general practitioner is subjected, but, in a handbook of this size, space is precious, and in this case it might with advantage have been devoted to further selections from the author's experience, rather than to a vindication of general practice in the abstract.

In the two chapters on anæsthetics there is to be found much that is worthy of attention. On the business side the potential general practitioner will find much help in such matters as book-keeping, the economical management of the dispensary, and the provision

of adequate, but not excessive, equipment for the surgery, as well as hints on the working of the National Health Insurance Act. These chapters will be of especial value in the present times of financial stringency.

E. H. V. H.

THE DIAGNOSIS OF NERVOUS DISEASES.—By Sir James Purves-Stewart, K.C.M.G., C.B., M.D. (Edin.), F.R.C.P. Seventh Edition, revised. London: Edward Arnold & Co., 1931. Pp. 730 plus viii, with 312 text figures and 1 coloured plate. Price, 35s. net

PURVES-STEWART's well-known textbook, first published in 1906, has now reached its seventh edition. Since the appearance of the sixth edition in 1924 there has been a considerable output of new work on the anatomy, and even more on the physiology, of the nervous system. The more important of these recent advances have been incorporated in the present edition and the sections dealing with the anatomy and physiology of the nervous system are among the best in the book. This is as it should be, for a firm grasp of these basic principles is an essential preliminary to an intelligent study of nervous diseases.

There is a little that calls for comment in this admirable volume. In the compass of twenty-nine pages there is one of the most lucid and succinct accounts of affections of the vegetative nervous system that it has been our good fortune to read. Sir James Purves-Stewart is an obvious non-Freudian and in his discussion of the psycho-neuroses he takes occasion to mete out dignified, but none the less severe, castigation to the too-ardent disciples of the Freudian school.

We have few adverse criticisms to make, but the statement on page 50 to the effect that the secretion of the posterior lobe of the pituitary increases the activity of the mammary secreting cells is not in accord with modern teaching. 'Pituitrin' is not a galatagogue; it does not stimulate milk formation, but merely causes expression of the milk already present in the breast by virtue of its action on the non-striated muscle fibres surrounding the mammary alveoli. At page 53 there is a printing error, *calloseu* instead of *callosum*. On page 197 we are told that periaxial encephalitis (Schilder's disease) 'may perhaps be due to a blood-borne virus having a selective action upon the oligodendroglia cells which regulate the lipoid metabolism of the medullary sheaths'. Could fanciful speculation go much further? In fairness to the author it should be noted that he is quoting from the observations of Levaditi and others. The book has an adequate index and the printing and binding conform to the best traditions of the house of Arnold.

J. M. H.

RECENT ADVANCES ON ALLERGY.—By G. W. Bray, M.B., Ch.M. London: Messrs. J. & A. Churchill, 1931. Pp. xii plus 432, with 98 illustrations including 4 coloured plates. Price, 12s. 6d. net

ANYONE who is interested in the subject of allergy should read this book, as it maintains the high standard of the recent-advance series. The author is a research scholar on the subject, and has gone into the whole question very thoroughly, giving all the references to the work that has been done on the subject. During the last few years a great impetus has been given to the study of asthma by the formation of a research committee in England on this subject. The book mainly deals with asthma and the pollen allergies. About 100 pages are devoted to the cutaneous manifestations of allergy, such as eczemas, urticarias, etc., as well as allergic dermatitis and the relationship of muco-membranous colitis and purpura is also discussed. The book is well got up, and is illustrated by 98 figures. There are references at the end of each chapter that are very necessary for workers on allergic conditions.

H. W. A.

HANDBOOK OF SKIN DISEASES.—By Frederick Gardiner. (Third Edition.) Edinburgh: E. & S. Livingstone, 1931. Pp. 283. Illustrated. Price, Rs. 7-14. Obtainable from Butterworth and Co. (India), Ltd., Calcutta

This book consists of a series of lectures given by the author to his classes on the commoner diseases that affect the skin. There are 12 coloured plates and moderately-good photographs illustrating these diseases. One is relieved to find that eczema no longer holds the rank of a disease. The articles are naturally very brief and sketchy, for example, the subject of epidermophytosis is dismissed in two and a quarter pages. These fungal diseases are extremely common, and in some of the schools in England a large number of the boys are affected by them. Moreover many of these diseases are increased by the occupation of the patient, and should not be confused with true trade dermatitis. The book can be recommended as an introduction to dermatology, and later on the practitioner can enhance his knowledge by studying the larger and more confusing textbooks on this subject.

H. W. A.

A TEXTBOOK OF SURGERY.—By John Homans, M.D. London: Baillière, Tindall and Cox, 1931. Pp. x plus 1195, with 513 figures in the text. Price, 40s. net

This textbook, which owes its inspiration to Dr. Harvey Cushing, is placed before the medical world to record and amplify the teaching of the members of the surgical staff of the Harvard Medical School. The work of compilation has fallen to the lot of Dr. John Homans and ably has he fulfilled his task. In the preface he informs us that some of the teachers sent him what might be described as monographs, while others sent him the briefest of notes, so that in the latter cases it has been his pleasing duty to put flesh and clothes on the skeleton.

An especially interesting feature of the book is an historical sketch at the beginning of each chapter, which not only gives the reader information of which he may have been ignorant but is written in the form of a story and in many cases is extremely diverting. In these sketches the classical work of the great surgical pioneers, as well as that of the more recent great men and women, is reviewed and this labour must truly have been, as the author states, 'a joyous task'.

The book follows the lines of most textbooks on the subject, that is it starts with bacteriology and inflammation, then passes to general surgical diseases, and finally to regional surgery. In the section which deals with gangrene there is an excellent treatise on thrombo-angiitis obliterans, and the operative treatment for this condition, as advised by White and Smithwick, is described in detail. In contra-distinction to this excellent section, that which is devoted to neoplasms is somewhat scanty. Tumours of the pituitary gland however have a chapter to themselves and are well described.

In discussing the ætiology of osteitis fibrosa cystica and allied bone diseases, no mention is made of the theory that these diseases are of endocrine origin. In view of the recent work which has been done in this connection by Mr. Donald Hunter, Professor Turnbull and others, in which the parathyroids are implicated, we are a little surprised that there is no suggestion that this disease may be due to hyper-parathyroidism.

The sections on the abdomen, especially that of 'hernia and the abdominal wall' are good, and the same can be said of the section that deals with fractures, the latter being especially well illustrated. There is no section on operative surgery, but a few specialised operations are described where it is considered necessary.

In a book of this size some printer's errors are inevitable. There are however very few, and these are for the most part unimportant, but there is one which should certainly be noted and altered in the next

edition, i.e., on page 816, line 37, the internal mammary artery is described as ending by dividing into the musculo-phrenic and deep epigastric instead of superior epigastric vessels.

The book is an admirable one, is well written in an easy and interesting vein which makes it a pleasure to read, and is amply illustrated with simple but descriptive diagrams and drawings.

We have no hesitation in pronouncing it a distinct adjunct to surgical literature.

H. E. M.

THE DIAGNOSIS AND TREATMENT OF BRAIN TUMOURS.—By E. Sachs, A.B., M.D. St. Louis: The C. V. Mosby Company, 1931. Pp. 396, with 224 illustrations including 10 in colours. Price, \$10.00

No branch of surgery has made such surprising advances during the last fifteen years as that dealing with the operative treatment of lesions of the nervous system. Not only have new technical methods, involving the use of complicated electro-surgical apparatus, been introduced, but there has also been a great improvement in methods of diagnosis, which is due to researches undertaken by radiologists in collaboration with surgeons having greatly extended the possibilities of accurate diagnosis. This branch of surgery has had its greatest development in America, where a small group of surgeons, led by Harvey Cushing, has been devoting itself exclusively to this subject for the past fifteen to twenty years, building on the foundations so well laid by Horsley, Macewen, Ballance and others. So specialised has the subject become that the articles in the ordinary textbooks are now quite inadequate as a guide to anyone taking up this branch, and the need for special monographs is obvious. It is fitting that such a book should be written by one of the leading exponents of this branch of surgery in America. The author sets out to show how a case of brain tumour should be studied, postulating that any man who goes into neurological surgery to-day should first have had a thorough training in neurology, only in this way can he develop his own critical judgment and not be merely the hands that do the work for the neurologist. Brain tumours constitute only a small number of the cases that belong to the field of neuro-surgery, but their diagnosis presents the greatest and most varied difficulties and hence provides the best training.

The first chapter in the book under review describes the anatomy of the brain from the surgeon's point of view, that is to say in relation to the topography of the head, face, and scalp, and gives a brief account of the physiology of the nervous system, without entering into the finer details, for which special anatomical textbooks are to be consulted. Chapter II outlines in tabular form the ordinary methods of history-taking and physical examination; this is followed by sections on perimetry, x-ray examination, and pneumo-ventriculography, with a warning of the dangers of the last-named method and advice to use it only when the diagnosis cannot be made in any other way; the value of the Bárány tests is also critically examined. There follows a long chapter on surgical pathology, illustrated by original figures; in this a résumé is given of Cushing and Bayley's classification of the gliomata and the confusing nomenclature is clarified as far as possible. Other tumours, together with vascular and inflammatory lesions, are more briefly dealt with and special praise must be given to the many beautiful illustrations and informative case histories which assist comprehension of this difficult subject. The next chapter deals with the symptoms and signs of raised intracranial pressure, followed by a detailed description of the focal signs and symptoms of growths of various regions. Tumours of the cerebellum, pons and medulla have a separate chapter and cerebello-pontine and 8th-nerve tumours are treated in some detail. Diseases of the pituitary gland come next and this chapter includes many original illustrations of cases, and perimetric charts. A section on differential diagnosis from

other conditions is followed by an excellent description of the modern technique of brain surgery, with an abundance of beautifully-executed illustrations.

It will be seen that this book has been prepared with the greatest care to present adequately the present position of neurological surgery, and the reviewer, having recently spent some time in two of the largest centres in America for this branch of work, can vouch for the accuracy of the picture. The diagnostic and operative technique in use in these centres was exactly as is described in this book; indeed the most surprising thing was the extent to which technique has become standardised and the revolution which the introduction of the improved diathermy machine, known as the Bovie electro-surgical unit, has effected in this branch of surgery. It will probably be some time before this line begins to be taken up in India, but those who aspire to be pioneers could not do better than study this book; its illustrations are beyond praise, and the numerous case histories are of the greatest assistance in forming mental pictures. Considering the expense of production of such a work the price is not excessive.

W. L. H.

SURGICAL DIAGNOSIS.—By American Authors. Edited by Evarts A. Graham, M.D. Philadelphia and London: W. B. Saunders Co. Three octavo volumes and Index volume. Pp. 2750; Illustrations, 1,275. Price, £7 10s. net

THESE three volumes offer a comprehensive survey by forty-three leading American authors of the subject of surgical diagnosis. The contributors have been carefully selected and their names are a guarantee that the work is thorough and up to date, or at least as up to date as a work of this kind can be. The third volume was published in 1930.

It would be invidious to compare the various sections. They are all well written, and the subject-matter is sufficiently compressed. Among the well-known authors we may mention Evarts Graham, the editor, who deals with the section on the liver and gall-bladder in a thoroughly efficient manner; Russell A. Hibbs, the spinal column; Alfred W. Adson, the spinal cord; Allen B. Kanavel, the hand; and Dandy, who deals with the skull. The editor is careful to prevent each contributor from unduly stressing his own subject.

The illustrations are numerous and their reproduction is excellent. The publishers have succeeded in producing three handsome volumes on good paper, strongly bound.

Reference has already been made to the difficulty in a work of this sort of ensuring that each section is fully up to date. On page 349 of Vol. III, for instance, in discussing the subject of intrahepatic abscess the author states that 'it is usually necessary in order to establish the diagnosis with certainty to make an exploratory operation'. He recommends a two-stage transpleural exploration for the common type of abscess, with excision of parts of the 10th and 11th ribs; in the second stage an exploratory needle is employed, and when located the abscess is drained. This method of diagnosis and treatment has been almost abandoned in India for many years. It is unnecessary and brings into the picture all the dangers of secondary septic infection for an abscess which is usually sterile except for the presence of *E. histolytica*. It is true that reference is made on page 352 to the work of E. O. Thurston, published in 1924, regarding the value of the aspiration and emetine method, but no more recent work on tropical surgery seems to have been consulted. To stigmatise the procedure of aspirating a liver abscess through the abdominal wall as 'exceedingly dangerous' (p. 350) suggests an absence of personal experience; the reviewer has carried out this operation in India some scores of times during the last twenty years and knows that the opposite opinion is correct.

Criticism on the same lines is necessary when studying other sections of the work. On page 770 of Vol. III, under elephantiasis (scrotum), the name *Filaria*

sanguinis hominis is incorrectly used. The references given under this heading also date from 1905 to 1923. It is a pity that the surgical work done during the last eight years is neglected.

These remarks are not intended to detract from the general excellence of the work. The criticisms are particularly selected from the sections dealing with tropical surgery, as this subject is generally singled out for neglect by surgeons in Europe and America. The three volumes provide a mine of information for the student and the practising surgeon, who will find the diagnosis of any surgical subject he wishes to look up discussed in a vigorous and refreshing manner.

F. P. C.

ANNALS OF THE PICKETT-THOMSON RESEARCH LABORATORY. Vol. VII.—London: Baillière, Tindall and Cox, 1931. Pp. 441, with 35 plates. Price, 42s. net

NOTHING has brought home to the reviewer more strongly the futility of all human endeavour than these Annals of the Pickett-Thomson laboratory. This is now the fifth volume on the subject of the streptococci and yet, we read in the preface, we are to expect two, if not three, more volumes before the subject can be completed. There are four hundred pages of text in this volume and it is not the largest that has been issued; there are about six hundred words on each page, which means that so far well over a million words have been written on the subject; and yet it is only a *summary* of the work done on one genus of the pathogenic micro-organisms of which there are thousands already recognised and probably many more thousands about which we know nothing. There will be something like 10,000 references on the subject by the time the work is completed. Many of these writers arrive at conclusions diagonally opposed to those of other writers whose work is reported, and we cannot help wondering whether the state of affairs which existed in the fifth century before Christ was not more satisfactory. Hippocrates may not have been precisely correct in all his opinions but at least they must have been safe for quoting to students, as what he said 'went', and there were not 9,999 authorities which might be quoted against any particular view he expressed.

It is only in very rare moments that the reviewer feels thus oppressed, and on the contrary few things give him a more pleasant reaction than sitting at his table and turning over the pages of these beautifully-printed and clearly-written Annals. This volume contains three monographs, XII, XIII and XIV, on the rôle of the streptococci in erysipelas, in skin diseases, and in measles, respectively; all are written by David and Robert Thomson. Erysipelas is a disease which is known definitely to be caused by a streptococcus and it is disappointing that the treatment of the disease is still on the whole unsatisfactory. Serum treatment is probably the most satisfactory, but, like asthma, erysipelas boasts a number of 'specific' treatments; this is always a bad sign.

In the monograph on skin diseases the authors stress the importance of the fact that streptococci are present in between 7 and 15 per cent. of normal skins; in almost all skin diseases therefore streptococci play a part, but the diseases in which they play the major part are not many; of the common skin diseases impetigo is practically the only one in which they are the undisputed specific ætiological factors.

The monograph on measles is the longest of the three, which is rather surprising in view of the fact that there is considerable doubt whether a streptococcus is the cause of this disease. We might almost go further and say that it is almost certain that the 'specific' cause is not a streptococcus. However, the authors have not confined themselves to the possible rôle of the streptococci in this disease, but have discussed all the theories regarding its ætiology and have succeeded in producing one of the best monographs on measles that we have read, not merely from the bacteriologist's point of view, but from the clinician's, as well.

There are in this volume 1,600 references, 35 beautifully-produced plates, and both a subject and an author's index. No medical institution of any standing can afford to be without these Annals.

L. E. N.

MONOGRAPHS OF THE PICKETT-THOMSON RESEARCH LABORATORY. Vol. I. The Vitamins.—

By E. Browning, M.D. (Liverpool). London: Baillière, Tindall and Cox, 1931. Pp. xxxii plus 575, with 3 plates. Price, 42s. net

THE issuing of this monograph marks a new departure on the part of the Pickett-Thomson Research Laboratory. We have hitherto received a volume of their Annals each year; for some years past these have been devoted to the streptococci but they have always dealt with the subject of bacteriology. The subject of vitamins is a biochemical one, but, as Dr. Ethel Browning has suggested in the preface, the proof of the pudding is in the eating and the clinical aspect of the problem is the important one. She points out that there has of recent years been a tendency to concentrate on the chemical side of the problem, on the investigation as the exact nature of vitamins. There is still some doubt as to whether these really are chemical entities. She has therefore attempted to counteract this tendency, and in this monograph has paid special attention to the clinical and experimental aspects of the problem. We should perhaps add that this does not mean that the biochemical aspect has been neglected in this volume; far from it.

The monograph commences with an historical sketch. This takes us back into the dark ages (as far as our knowledge of vitamins is concerned) of 25 years ago. Prior to this a few isolated observations had been made regarding lemon juice in the treatment of scurvy. It may be said that the vitamin here was started by beri-beri. After these 25 years of intensive study of the subject we now know a great deal about vitamins, but it does not seem very certain that we know such a great deal more about beri-beri.

In part I, consisting of about 60 pages, vitamins in general are discussed; the other two parts are devoted to fat- and water-soluble vitamins, respectively. Each vitamin is dealt with separately under various headings, such as occurrence, chemical nature, stability, physiological effects of deficiency, pathogenesis of deficiency, and its presence in various foodstuffs.

There are about 350 pages of text, a very valuable table covering 50 pages from which one can see at a glance the vitamin content of any foodstuff, at least one can see which vitamin the various authorities on the subject have claimed for each foodstuff, but there is by no means unanimity of opinion in this matter; the author's summary and conclusions; about 3,000 references to the literature; seven full-page plates; and two separate indexes. The whole forms a magnificent piece of work. We heartily congratulate the author. No worker on the subject can possibly afford to be without this monograph, and we foresee that it will be a standard work on the subject for many years to come.

TEXTBOOK OF GENERAL BACTERIOLOGY.—By E. O. Jordan, Ph.D. Tenth Edition. London and Philadelphia: W. B. Saunders Company, Ltd. Pp. 819. 200 Illustrations. Price, 28s. net

THIS is the tenth edition of this well-known textbook on bacteriology. No radical changes have been made since the last edition, which was reviewed in this *Gazette* in December 1928. The scope of the work is the same and no new sections have been added. The length of the book is slightly increased.

It is a book well suited to the student, whilst giving the necessary details for identification and culture of the various organisms, it does not dwell unduly on the bacteriological aspect of the subject, but gives a few concise details of the diseases caused by the various micro-organisms and of the treatment to be adopted in combating the infections.

The main criticism we have to offer is that the author seems to be little aware of any recent work that has been done in any country other than America. This of course detracts from the book's value but probably not from its popularity, in America; in other countries, this trait of the author is likely to diminish the book's popularity as well as its value. The chapter on bacteriophage is very inadequate and not up to date.

The author has taken the wise precaution of obtaining the help of a protozoologist for the chapters on protozoa; Professor Taliaferro, who assisted him, has an established reputation in this branch of science. However, we challenge his right to Americanize the spelling of scientific names, e.g., *Endamæba histolytica* is written as *Endameba histolytica*.

The book is quite up to the standard of its predecessors, as regards the information imparted and the quality of the format; in both instances these standards were high. We can confidently recommend the book to the student.

L. E. N.

CLINICAL DIAGNOSIS BY LABORATORY METHODS.

—By James Campbell Todd, Ph.B., M.D., and Arthur Hawley Sanford, A.M., M.D. Seventh Edition. London and Philadelphia: W. B. Saunders Company, Ltd., 1931. Pp. 765, with 347 illustrations, 29 in colours. Price, 28s. net

THERE are many books of this kind; the one on which the reviewer was nourished in his early days as a clinical pathologist was Sahli's, but that has not been reprinted, or at any rate has not been translated, for many years. The present volume seems to come as near as possible to replacing Sahli's classical work, and it will certainly take a place next to this book on the reviewer's bookshelf. Dr. Todd's book is in its seventh edition, and each edition has undergone many reprintings. Dr. Sanford, who became co-author of the last edition, has undertaken the present revision alone. The previous edition was published as recently as 1927, so that extensive additions were not necessary; the most important of these is a discussion on the Ascheim-Zondek test.

There is an introductory chapter on the use of the microscope and then successive chapters on examination of the sputum, the urine, the blood, gastric and duodenal contents, the faeces, animal parasites, pus and other body fluids, miscellaneous examinations including divers subjects such as the pregnancy tests and diagnosis of rabies, sero-diagnosis, bacteriological methods, and vaccines and skin tests: there is also an appendix on laboratory equipment and apparatus, and finally a useful index.

The chapter on the blood is very comprehensive; it covers nearly two hundred pages and would by itself make a useful monograph; it includes the cytology and the various counting methods, chemical examination, blood parasites, bacteriology, methods of detection of blood, and other examinations. The section on animal parasites is also good. The plate illustrating the ova found in stools is one of the best of its kind, it is prepared from actual photographs and is not the usual exceedingly 'diagrammatic' drawing. Even the sections which deal with parasites of tropical disease is free from the gross inaccuracies one is so used to in books of this nature. In many cases the subject is perhaps dealt with rather summarily and the details given would not materially assist any one unfamiliar with these diseases in arriving at a diagnosis; e.g., gland puncture is suggested as a diagnostic method in visceral leishmaniasis and there is no mention of the serum tests. On the other hand the coloured plates of malarial parasites should prove distinctly helpful, though we think it a pity to give an abnormal picture rather than a typical one; we do not doubt the genuineness of the 'exact reproduction' of the blood film showing a malignant tertian infection, but it may be many years before even the worker in the tropics sees a case in which there are as many as a million parasites per cubic

millimetre, and the crescent depicted is not a very typical one.

We can thoroughly recommend this book to both the clinician and the laboratory worker. The printing and paper are of the usual high standard that we have been taught to expect from this firm of publishers.

L. E. N.

A MANUAL OF EMBRYOLOGY.—By J. Ernest Frazer, F.R.C.S. (Eng.). London: Baillière, Tindall and Cox, 1931. Pp. viii plus 486, with 282 text figures. Price, 30s. net

PROFESSOR FRAZER's book is a very useful addition to the ranks of textbooks of embryology. The author has attempted—and with success—to present embryology in a manner differing radically from that followed by the majority of writers on this subject. The so-called regional method has been adopted by which is meant the presentation of a 'connected mental picture of the developing embryo, rather than a patchy series of discrete descriptions of the formation of organs'.

The book is divided into two parts: part I (the first ninety odd pages) deals with early and general development, and part II with the development of organs and regions. In discussing the growth of the fertilised ovum Professor Frazer emphasises a fact too often overlooked, viz, that the details of such growth prior to the ovum becoming embedded in the uterine wall are based entirely on theoretical considerations.

In a hurried survey we were particularly impressed with the section of the book devoted to the development of the abdominal viscera.

We detected very few errors and these mostly attributable to the printing room, e.g., at page 161, line 12, *hind-brain* should surely be *mid-brain*.

There is an adequate index, and printing and binding are well up to standard. We think this book is assured of a warm welcome from students of all ages.

J. M. H.

ESSENTIALS OF PSYCHIATRY.—By George W. Henry, A.B., M.D. Baltimore: The Williams and Wilkins Company, 1931. Pp. xiv plus 304. Price, 21s. net. Obtainable from Baillière, Tindall and Cox, London

DR. HENRY has achieved a really remarkable feat in writing a first-class book on modern psychiatry. That this book is now in its second edition will not surprise anyone who takes the trouble to read it. Indeed, the book is so good in so many and diverse directions that it is difficult to know how to begin to praise it, and when to stop. Although the book is by no means big—only 304 pages—it contains an enormous mass of information, including, besides general psychiatry, a chapter on each of the following subjects: mental hygiene, psychiatric social service, medico-legal aspects of psychiatry, psychiatry in general hospital practice, and the history of psychiatry. To all this is added an admirable chapter on psychiatric nursing by Adele Poston, former Directress of Nursing, Bloomingdale Hospital, New York. In spite of the immensity of the ground which the book covers, the reader does not get the impression that the essentials of psychiatry are being presented to him in tablet form. Dr. Henry adopts a very up-to-date and wholly unobjectionable classification of mental disorders, which itself is no mean achievement. He divides mental disorders into four main groups: affective psychoses, toxic psychoses, organic psychoses, and constitutional inferiority. In the first group he places paranoia, schizophrenia and psychoneurotic disorders, and his treatment of this group is quite a masterpiece in its way. Some alienists may object to Dr. Henry's discrimination between paranoia and paranoid psychoses as being too nearly related to warrant drawing a line between them. In the portion devoted to epilepsy the high level of Dr. Henry's work falls a little, so that, unless this portion be altered and improved in a subsequent edition, his treatment of epilepsy will remain a dull spot on an otherwise

brilliant ground. It is a pity that Dr. Henry helps to perpetuate the use of the terms 'essential' and 'idiopathic' in reference to epilepsy. Both terms are meaningless and should receive every encouragement to become obsolete. Nowadays, the term cryptogenetic is better employed to cover the connotation of the terms idiopathic and essential. In his interesting little collection of personal histories of notable persons who have shown psychopathic traits in their temperament or character, Dr. Henry indulges in the common error of believing that Napoleon Bonaparte suffered from epilepsy. There is no evidence at all that Napoleon's nervousness ever rose to the pitch of convulsions. No life was ever more closely watched than Napoleon's, and the documents, upon which this assertion that he was an epileptic is based, are scanty, confused and untrustworthy. Also, Dr. Henry is mistaken in believing that Napoleon's mother was of lowly origin. On the contrary, Maria Letitia Ramolini belonged to a very good family. These defects are however trivialities and make no difference whatever to the value of the book as a work on modern psychiatry. The book has an admirable bibliography and a good index. It is to be hoped that the book will find a wide sale in this country for it is the very work to recommend to practitioners and students of medicine in India.

O. B-H.

BENDIEN'S DIAGNOSTIC METHODS FOR CANCER AND PRINCIPLES OF TREATMENT.—By A. A. Miller, M.D. London: H. K. Lewis and Co., Ltd., 1931. Pp. 80, with 1 table and 9 illustrations. Price, 3s. 6d. net

New ideas and theories on cancer must always prove of interest and excite the hope that science has at last something to offer for this terrible scourge. Unfortunately, the world has been led into vistas of false hope before; this is partially, I think, due to the great desire for headlines in the lay press. The subject of the causation and cure of cancer, though much has been done, still appears to be surrounded with mystery and we trust that the work of Dr. Bendien will receive confirmation and help to raise the veil.

The little book by Dr. Millar gives a very clear account of Dr. Bendien's ideas, the latter ascribes cancer as due to an extrinsic factor, a local persistent irritation, certainly a factor that cannot be overlooked with impunity, and a second factor which is a change in the serum associated with a higher negative charge which can be demonstrated with a modified cataphoresis apparatus. Bendien considers that an efficient treatment should aim at correcting this abnormality in addition to the higher negative charge on the serum colloid. Bendien also describes a flocculation test with ortho-sodium vanadate and acetic acid solutions by means of which cancer can be diagnosed. This test is described clearly and can be easily carried out. The flocculation test in conjunction with a clinical examination is usually sufficient to diagnose cancer, but in some cases he elaborates the test by submitting the precipitate obtained after certain treatment to spectrophotometric absorption measurement in the ultra-violet and claims that from the curve obtained certain conclusions can be drawn. We admit that we have not examined precipitates prepared according to the Bendien technique, but our experience with this instrument makes us rather chary of drawing conclusions on ordinary serum-absorption tests, and we trust that this will be dispelled in using the method described. As regards treatment we agree that if the tumour is operable it should be removed, but as regards the question of the usage of a serum for injection to which certain substances are added to counteract the altered electric charge of the abnormal serum we are unable to express any opinion as the information available in the book is altogether too meagre.

The little book is well got up, and the printing and paper are excellent. It should prove of great interest to those who desire to familiarise themselves with

Dr. Bendien's ideas on the diagnosis and treatment of cancer.

T. C. B.

MORE FROM THE PRIMEVAL FOREST.—By Albert Schweitzer, Dr. Theol. Dr. Med., Dr. Phil. (Strasbourg). Translated by C. T. Campion, M.A. London: A. & C. Black, Ltd., 1931. Pp. 173. Illustrated. Price, 6s. net

DR. ALBERT SCHWEITZER is a doctor of medicine, a doctor of theology and a doctor of philosophy; he has also written a monograph on J. S. Bach, consisting of two octavo volumes; as this has been translated into English, we gather that it is a book of some consequence. Yet, he has dragged himself away from all his interests in Europe and devoted a valuable part of his life to medical missionary work in equatorial Africa. Such a man must be either a restless crank or a true altruist, and, as it is obvious from his writings that Dr. Schweitzer is not the former, he must be the latter. Between 1913 and 1917 he established a hospital at Lambarene in the French Congo, but circumstances, his health and, we presume, the War, necessitated his leaving Africa in 1917. He returned in 1924 to take up the work which he had been compelled to leave.

The volume under review is a diary of his life and work during a period of about three and a half years from this date. The first pages tell of his struggles to get even a few sewn leaves to keep the water out of the old buildings of his former hospital which he had decided to reconduct; the last of his departure from Lambarene leaving behind him a new large well-constructed and comparatively well-staffed hospital which he has built almost with his own hands. The difficulties with which he had to contend were incredible; the last and most distressing set-back, one which was perhaps a blessing in disguise—but in a very dark disguise, involving the loss of many lives—for it determined the removal of his hospital to a new and larger site, was a dysentery epidemic in his old hospital.

Dr. Schweitzer has a large heart; in it he found room for not only the most ungrateful of his patients but for baby baboons whose mothers had been shot, for frogs, ants and even palm olives which the tropical undergrowth threatened to strangle. The ingratitude and heartless indifference to the sufferings of others that the aboriginal savages almost always displayed must have distressed him more than anything, though he never complains or seems to expect anything else and relates with great joy any exceptions.

The diseases with which he has to contend are mainly sleeping sickness, dysentery, frambæsia, ulcus tropicum, leprosy, and elephantiasis. Lacerated wounds, usually inflicted by wild animals, and cases of poisoning were also common. For frambæsia in children he advocates Stovarsol in the place of Neosalvarsan, mainly because he had difficulty in giving intravenous injections to these patients, for sleeping sickness—Bayer 205 and Tryparsomide, for ulcus tropicum—a thorough irrigation with 1/6,000 mercury cyanide, and for leprosy—chaulmoogra oil. For septic wounds he is a great believer in methyl-violet; his point is that dressings must always be damp for the full benefit to be produced. The book is a straightforward narrative of a great endeavour that has certainly been crowned with success. The story is simply told with the minimum of emphasis on the first personal pronoun singular. There is not a dull page in the whole book. Medical missionaries working in Africa will find many valuable hints in it; everybody will find inspiration.

The translator is to be congratulated on producing a result which contains the minimum of stigmata of a translation. The scientific name for hookworm infection has many spellings, but we doubt if *angkylostomiasis* will find many supporters. In the index the 'g' has been dropped; *ameylostomiasis* is, we believe, now considered to be the correct spelling.

He frequently uses 'to recruit' in the sense 'to recruit health'. The use is, of course, legitimate, but it is liable to mislead his reader now and then, especially

as labour was one of the main difficulties in Lambarene; 'recuperate' would be less likely to give rise to ambiguity. 'I disclose to them what is under weigh' is not an uncommon usage, but is, nevertheless, incorrect.

The elephantiasis tumours which are frequently referred to must be scrotal tumours, though as far as we remember they were not referred to as such; this seems unnecessary prudery in a work of this kind.

We can thoroughly recommend the book for pleasant and profitable reading. It is well produced and good value for six shillings.

L. E. N.

AN OUTLINE OF THE HUMAN BODY.—By A. David Belillos, M.B., B.S. (Lond.), D.P.H. (Eng.). London: George Routledge and Sons, Ltd., 1931. Pp. x plus 190, with 62 illustrations. Price, 3s. 6d. net

As the writer says, a study of the human body is not only essential for doctors and nurses, who need to know all about it from a professional point of view, but is a matter of considerable interest to any intelligent person, as it exemplifies the structure and working of a machine, far more perfect than has ever been constructed by man. This book outlines in simple words the structure and the mode of working of this machine.

It is a book which will be appreciated by intelligent laymen and by nurses, and its perusal would benefit a first-year medical student considerably. As a book of its kind, we can strongly recommend.

THOSE TEETH OF YOURS: A POPULAR GUIDE TO BETTER TEETH.—By J. Menzies Campbell, D.D.S., L.D.S., F.R.S.E. Revised and enlarged. Second Edition. London: William Heinemann (Medical Books), Ltd., 1931. Pp. 147, with 17 illustrations. Price, 3s. 6d. net

THE first edition of this book was published in 1929. That it has gone on to a second edition shows that it is proving popular with lay readers. People are taking more interest in health than they ever did before and popular books on health and hygiene are getting deservedly popular. Dr. Campbell has done a distinct service by bringing before the public a book on dental hygiene, written in non-technical language, which the man in the street may read with profit.

The book begins with a short survey of the history of dentistry. It is greatly to be deplored that Dr. Campbell has missed the contribution of ancient Indian Medicine to the evolution of modern dentistry. Thakore Sahib of Gondal in his book 'History of Aryan Medical Science' (p. 29) shows the earliest record of dentistry in the *Salpitha Brahmana* of the Vedas, about 5000 B.C. Max Muller in his 'Sacred Books of the East', Part I, page 282, also confirms this. In this connection we would like to bring to the author's attention the very valuable article of Dr. J. J. Modi, I.M.S., I.A.S. (Eng.), entitled 'Dentistry in Ancient India' published in the January 1931 issue of the *Indian Dental Journal*.

The book goes on to a description of the teeth and their surrounding parts, the causes of dental caries and pyorrhea alveolaris. This is followed by a chapter on children's teeth and the pre-natal care of the mother. The chapter on teeth in relation to general health is very well written and is a subject which should receive the attention of all people who claim at all to know anything about health. The rôle that dental sepsis plays in the causation of general disorders of the system is oftentimes not known to lay people at all. This fact should be more widely broadcasted, if we are to increase the resistance-level of the people. Dr. Campbell has done well to lay emphatic stress on this aspect of the subject. We recommend the book to all public school teachers and medical authorities in charge of Public Health Departments. It should be in every school and public library. Altogether it is a very well written book on a most important part of the body, which unfortunately does not receive the recognition

it deserves. The printing and get-up are excellent and do credit to the well-known publishers.

R. A.

OTHER BOOKS RECEIVED

The Indian Education Problem: A Solution.—Parts I to III. By J. C. Ghosh, B.Sc. (Manchester), F.C.S. Published by J. C. Ghosh, Calcutta. 1931. Cloth bound. Price Re. 1-8 net.

Eugenics and Birth-Control.—By M. Hennes-Wood. Published by The Times Publishing Co., Lahore. 1931. Price Rs. 3.

Miracles of Healing and How they are done.—By J. E. Barker. Published by Messrs. John Murray, London. 1931. Price 7s. 6d. net.

Annual Reports

MALARIA INVESTIGATIONS IN SOME PARTS OF THE TRANSVAAL AND ZULULAND. BY N. H. SWELLENGREBEL, PROFESSOR OF PARASITOLOGY, UNIVERSITY OF AMSTERDAM, HOLLAND; S. ANNECKE, M.A., M.B.B.S., D.P.H., D.T.M.&H., MEDICAL INSPECTOR (MALARIA), PUBLIC HEALTH DEPARTMENTS, UNION OF SOUTH AFRICA; AND B. DE MEILLON, M.Sc., F.E.S., ACTING ENTOMOLOGIST, SOUTH AFRICAN INSTITUTE FOR MEDICAL RESEARCH, JOHANNESBURG

In a previous number of the *Gazette* we reviewed a Report on Malaria in the Union of South Africa by Professor Swellengrebel. In this report Professor Swellengrebel stated the results of his enquiries and observations and the conclusions he had arrived at. The present publication of the South African Institute for Medical Research presents the grounds on which the first more general report was based. *Anopheles gambiae* (*costalis*) and *A. funestus* are the two principal malaria carriers of South Africa. They exhibit definite life habits which admit of a method of antilarval control on the principle of *species sanitation*, i.e., these species are sufficiently selective in the choice of their breeding places to allow of their being destroyed without the necessity of dealing with all kinds of water collections in a particular area.

A. funestus has the group habits of *A. listoni*, *minimus* and *aconitus*. It is a stream breeder in the foothills of the Drakensbergen. Shade in moderate amount is desirable. The water selected is clear and fresh. It does not breed in seepages or swamps, or standing water in streams. It does not breed above 3,000 feet.

A. gambiae (*costalis*) has also very definite habits and breeding places. It resembles *A. vagus* in some ways. It breeds in pools, not necessarily clear pools, but pools which have recently received fresh rain water; repeated showers of a week's interval are absolutely necessary. It does not breed in seepage pools. It is therefore entirely dependent on rain. It breeds in road-side puddles with no vegetation. Water pools at the sides of rivers are also suitable. These observations fit in well with epidemiological facts so far as *costalis* is concerned, but in many places the observers found profuse *funestus* breeding places with little malaria. These latter were in very sparsely populated areas however. Direct evidence in dissections show fairly heavy infection of both *funestus* and *costalis* (18 and 17 per cent.). The observers are of opinion that new comers are better gametocyte carriers than indigenous people in hyper-endemic areas. Zooprophylaxis is of no use as the kraals for cattle are open.

The authors make some interesting observations on immunity and tolerance to malaria in natives, Europeans, and Indians. Indians show a much higher

morbidity in malaria than natives under similar circumstances. In native reserves in highly-endemic foothill areas, a high degree of tolerance to malaria was found. This fact makes this class of adult native particularly valuable for labour. (This is very similar to what occurs with the Santhals and Jeypuris in India.) This results in the adult suffering little from malaria fever, a low spleen index, and a small parasite rate. Children under these conditions are the highest crescent carriers. The authors think that there is evidence of a certain amount of *inherited* tolerance in the children; the average spleen enlargement is not as large as in the Far East. They draw a distinction between immunity and tolerance. Immunity is an allergic reaction; tolerance an indifference to the malarial organism. Immunity is shown by a reduction of the parasite rate with a continuance of high spleen rate. Tables and graphs illustrate these arguments and statements. The report is clearly expressed and of considerable interest in the general study of malaria.

SIXTH ANNUAL REPORT OF THE PASTEUR INSTITUTE, CALCUTTA, FOR THE YEAR 1929. CALCUTTA: BENGAL SECRETARIAT BOOK DEPOT. 1931. PRICE, 8 annas or 9d.

This report, by Major E. C. R. Fox, I.M.D., the Superintendent, shows the enormous increase in the work of this Institute. It probably treats a larger number of patients annually than any other Pasteur Institute in the world, and that in utterly inadequate accommodation. The scheme was originally a small one, the intention being to provide a local antirabic centre in Calcutta for patients from Bengal, which could be reached within about 24 hours by all patients from the province, instead of sending them the long journey to Shillong. No one anticipated the immense expansion that has taken place; the numbers treated or advised have risen from 1,995 in 1924 to 10,219 in 1929; in six years 43,001 patients have been treated or advised. The figure for 1929 shows an increase of 643 over those of the previous year, and that in spite of the opening of a new antirabic institute at Patna in August 1929 for the province of Bihar and Orissa.

At present the vaccine is not being issued from Calcutta, and all patients have to attend at Calcutta. There is an immediate and most urgent necessity for building a really suitable new Pasteur Institute for Bengal, adequate to and worthy of the requirements of the province. With properly-equipped laboratories and apparatus the vaccine could then be issued to centres throughout the province, in the hope of its reaching every person bitten, whilst the annual cost to Government would be more than halved. Funds, however, are of course not available, and, as matters are, the best has to be made of a bad environment. The institute is housed in the ground floor of the Calcutta School of Tropical Medicine, with the heavy traffic, noise, and dust of Central Avenue outside its windows. One and the same room has to be used for inoculations, surgical dressings, and as an office, and a very distinct element of risk of sepsis is present, whilst instances of pick-pocketing have occurred. A dust-proof room, in which the vaccine is prepared, was completed and brought into use during the year.

Disturbed political conditions in Bengal in 1929 made it exceedingly difficult to follow up the after-histories of patients treated in that year. The report records that 72.8 per cent. of replies were received from the total of 8,099 patients who completed treatment, and 75.2 per cent. from those in Class IV (extensive deep bites and all bites on face and head). There were 43 deaths from hydrophobia reported, to which 7 other deaths have been added which had been reported to have occurred, but where the cause of death was not recorded. The total hydrophobia rate was 0.62 per cent., and the failure rate 0.28 per cent. This last figure is extremely satisfactory, and shows the splendid results achieved under extremely difficult and adverse conditions of working. Only 32 per cent. of the European

inspectors seem to succeed very well in getting one cleaning of every house done once a year. As in many other cities in the tropics, it is respiratory disease and not actual tropical disease which constitutes the main cause of mortality. Plague and cholera are at present practically absent from Hong Kong. Tuberculosis however is rife giving a mortality rate of 1.85 per 1,000; and broncho-pneumonia has the same figure. Much of the latter is really probably tuberculosis. Many Chinese go off to die in their own country so that the tuberculosis death rate is probably in the neighbourhood of 4 or 5 per 1,000. Under housing conditions such as have been described, with no sanatorium or special tuberculosis hospital, and a shortage of ordinary hospital accommodation, and taking into consideration the expectorating habits of the Chinese, it is obvious that the tuberculosis problem sums up in itself the real sanitary problem of the city. Plague and cholera are only occasional visitants. There seems to be a good lot of malaria about, but the spleen rates are astonishingly low. A malariologist has just been appointed and has commenced detailed investigations. *A. maculatus* and *minimus* seem the culprits. As might be expected, enteric fever is common and 221 deaths were reported. Small-pox seems to be an annual bugbear, and the Chinese show an indifference to the disease and a reluctance to notify it. Most cases are concealed in homes until they die, when the corpses are dumped in the street at night. Beri-beri is not endemic and the death rate from it was only 0.59 per 1,000.

The water supply is good but not too abundant. Human excreta is a saleable product and the bulk of it is collected in junks and shipped to China to nourish mulberry trees for the culture of silk worms. (How about the impossibility of making silk purses out of sow's ears?) The water carriage system is therefore very slow of development.

The methods of medical and sanitary administration seem rather confused. The Director of Medical and Sanitary Services has apparently little or no control over the Sanitary Department. The Sanitary Department has at its head a layman. There is a 'Sanitary Board', but it is purely advisory. 'The present machinery for the promotion of public health is complex in that responsibility for the organisation of energy both for the cure and prevention of disease is divided among a number of units, governmental and non-governmental, which operate more or less independently of other.' In 1929, the Director was placed on the Sanitary Board instead of the Medical Officer of Health, but this was reversed in 1930. The whole system would seem to require considered reconstruction. There are a large number of hospitals, some governmental, and some under Chinese administration. The Government Bacteriological Institute, under the control of Dr. E. B. Mallet, carries out a large amount of routine and research work, and the analyst's report contains an account of varied activities.

The whole report makes interesting reading.

Correspondence

INDIAN SPECIES OF ARTEMESIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In the article by Lieutenant-Colonel Chopra and Dr. Mukherji on Indian species of *Artemesia* produced in your November number, the fact that the Government Medical Store Department has been manufacturing santonin from Indian *artemesia* for a considerable number of years is not mentioned. It may therefore interest your readers to know that since 1923 the Medical Store Depot in Madras has manufactured more than two hundred pounds of santonin, and in fact from 1926 to 1931 was supplying nearly all Government requirements of this drug by manufacture.

The *artemesia* used was *Artemesia brevifolia* from Kashmir, of which the 60,000 pounds extracted produced on an average 0.345 per cent. of santonin.

This manufacture has however now been abandoned, as the increased price asked for the *Artemesia* and the fall in the world price of santonin have together resulted in importation being more economical.—Yours, etc.,

G. G. HIRST,
LIEUTENANT-COLONEL, I.M.S.,
Officer in-Charge,
Medical Store Department.

MADRAS,
15th December, 1931.

PSYCHOLOGICAL ASPECTS OF OPIUM ADDICTION

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Having read with much interest the contribution in the current number of the *Indian Medical Gazette* by Lieutenant-Colonel R. N. Chopra and Dr. J. P. Bose entitled 'Psychological Aspects of Opium Addiction', may I be allowed to call the attention of these authors to recent studies in the treatment of the opium and morphia habit with insulin? In the *Schweizer Archiv für Neurologie und Psychiatrie* there has appeared recently a paper by Dr. F. Braun of the Burgholzli Mental Hospital at Zürich, entitled 'Insulin zur Bekämpfung der Abstinenzerscheinungen bei plötzlichen Morphiumentzug'. Dr. Braun, following the previous experience of Dr. M. Sakel, recommends an initial injection of 20 units of insulin 'Hoglandol' (Hoffman La Roche), and on the following days, 30, 40 and 60 units, respectively. At night Dr. Braun advises 0.4 gm. of Luminal intramuscularly, with or without scopolamin. The dosage of insulin can usually, after reaching 60 units, be reduced by 20 units a day. Dr. Braun cites a case in which the patient received as much as 100 units in one day in five injections between 3 a.m. and 8 p.m. The over-action of the pulse, which may follow the injections of insulin, can be controlled by Coramin or Cardiazol.

If any reader of the *Indian Medical Gazette* has occasion to try this treatment, I should deem it a great favour to have his (or her) report on its success or otherwise.—Yours, etc.,

OWEN BERKELEY-HILL,
LIEUTENANT-COLONEL, I.M.S.

KANKE, RANCHI,
24th December, 1931.

Service Notes

APPOINTMENTS

THE services of Lieutenant-Colonel J. Taylor, D.S.O., have been placed at the disposal of the Bombay Government for appointment as Director, Haffkine Institute, Bombay, with effect from the date on which he assumes charge.

Lieutenant-Colonel C. A. Godson, M.C., on return from leave, is appointed as Civil Surgeon of Hooghly, with effect from the afternoon of the 24th November, 1931.

Lieutenant-Colonel E. H. V. Hodge, is appointed as Civil Surgeon, Jalpaiguri, with effect from the 3rd December, 1931, *vice* Lieutenant H. A. Young, I.M.D., granted leave.

Lieutenant-Colonel G. M. Millar, O.B.E., on return from leave has been posted as Civil Surgeon, Ajmer and Chief Medical Officer, Rajputana, with effect from the 10th November, 1931.

Lieutenant-Colonel I. D. Jones, on return from leave is appointed to be Civil Surgeon, Karachi.

The services of Major L. A. P. Anderson, have been placed temporarily at the disposal of the Government of Burma for appointment as acting Director, Pasteur Institute, Rangoon, with effect from the 2nd November, 1931.

The services of Captain B. S. Nat have been placed temporarily at the disposal of the Government of the Punjab, with effect from the 16th October, 1931, for appointment as Professor of Anatomy, King Edward Medical College, Lahore.

The services of Captain G. S. Gill have been placed temporarily at the disposal of the Government of Madras from 16th November, 1931, for employment in the Jails Department.

LEAVE

Major R. Hay has been granted leave for 3 months, with effect from the 23rd September, 1931.

PROMOTIONS

Lieutenant-Colonel L. Cook, C.I.E., has been promoted to the rank of Colonel, with effect from the 9th August, 1931, with seniority from the 26th January, 1926.

The seniority of Lieutenant J. R. Dogra has been ante-dated to the 25th August, 1929.

RETIREMENTS

Colonel S. R. Godkin, D.S.O., has retired from the service, with effect from the 22nd October, 1931.

Lieutenant-Colonel A. C. Anderson has retired from the service, with effect from the 11th October, 1931.

Notes

CAROTENE B. D. H.

RESEARCH work on the subject of carotene has now extended over a period of more than twelve years, but the recent literature on it tends to show that the former confusion is in process of being cleared up. Steenbock and others pointed out as long ago as 1919 that carrots, tomatoes and other coloured vegetables appeared to be rich in vitamine A, and that there is a relationship between carotenoid pigments and this vitamine.

Later workers however claimed that pure carotene was biologically inactive, and that its apparent activity was in reality due to contamination with vitamine A. All this, however, was prior to the differentiation of vitamin A and D, and the early negative results with carotene may have been due to deficiency of vitamine D in the diet of the experimented animals. Further, carotene is a highly unsaturated hydrocarbon, and as such it is very readily oxidised: hence the nature of the menstruum in which it is dissolved is of importance.

Experiments by von Euler in Sweden, and Moore in England in 1930 show that carrots—which in themselves do not contain any vitamine A—have the capacity for producing vitamine A in the animal body. It is now held that carotene is pro-vitamine A, just as ergosterol is pro-vitamine D; the conversion into the vitamine itself by the animal mechanism taking place after ingestion, and the vitamine being stored in the liver. Green and Mellanby in 1930 have come to the conclusion that carotene is quite as active as is vitamine A in raising the resistance of the body to auto-infections and septic processes.

Carotene B. D. H. is made in the British Drug Houses Chemical Works by a scientific process of extraction from carrots, and is carefully purified. It is a pure crystalline substance, and is put up in 2 mgm. pellets—sugar-coated. The dosage is 3 to 5 pellets orally a day in the treatment of mild infections, with larger doses for more severe cases. Carotene B. D. H. is issued in bottles of 50 pellets at 6s. per bottle.

LONDON MEDICAL EXHIBITION

NEW HALL, ROYAL HORTICULTURAL SOCIETY,
WESTMINSTER, OCTOBER 19TH TO 23RD, 1931

Notes on the Burroughs, Wellcome & Co. Exhibit

A NUMBER of Burroughs, Wellcome & Co. products issued since last year's London Medical Exhibition were shown. They included 'Barolac' a barium sulphate suspension for use in radiographic examination of the alimentary tract, 'Hypoloid' sodium morrhuate a sclerosing agent stated to be innocuous to the subcutaneous tissue and therefore to minimise risk of 'injection ulcer', 'Tabloid' carotene, 'Hypoloid' 'Epinalin', etc. 'Epinalin' adrenalin and ephedrine solution for local application by means of a spray or swab was first exhibited at the 1930 London Medical Exhibition. 'Hypoloid' 'Epinalin' is intended for administration by injection. A product of particular interest was 'Diginutin' a stable solution of the total glucosides of digitalis leaf, physiologically standardised. The stability of 'Diginutin' and the deterioration of tincture of digitalis were graphically contrasted by charts.

Illustrations demonstrating the value of cod-liver oil in rickets and in cases of vitamine A deficiency were shown in conjunction with 'Kepler' products which are ideal dietary adjuncts presenting the vitamins in their natural form and association.

A very comprehensive range of therapeutic agents of animal origin were exhibited including 'Tabloid' products of glandular substances and extracts such as 'Infundin' Pituitary (Posterior Lobe) Extract and 'Wellcome' brand liver extract. Prominence was also given to ephedrine and its preparations.

A novel feature was the exhibition of a number of stereoscopic transparencies illustrating the technique of different methods of hypodermic injection.

Publishers' Notice

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles are entitled to receive 25 reprints *gratis*; additional reprints can be obtained on payment. No reprints will be supplied unless contributors ask for them at the time of submitting their manuscripts.

Communications on Editorial Matters, Articles, Letters and Books for Review should be addressed to THE EDITOR, *The Indian Medical Gazette*, c/o The Calcutta School of Tropical Medicine, Central Avenue, Calcutta.

Communications for the Publishers relating to Subscriptions and Advertisements should be addressed to THE PUBLISHERS, *The Indian Medical Gazette*, P. O. Box No 54, Calcutta.

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The Editors of *The Indian Medical Gazette* cannot advise correspondents with regard to prescriptions, diagnosis, etc., nor can they recommend individual practitioners by name, as any such action would constitute a breach of professional etiquette.

Original Articles

THE INTRADERMAL METHOD OF INJECTING HYDNOCARPUS PREPARATIONS IN LEPROSY

By E. MUIR, M.D., F.R.C.S. (Edin.)

Leprosy Research Worker, School of Tropical Medicine, Calcutta

THERE is a consensus of opinion among those who have used the intramuscular and intradermal methods of injecting hydnocarpus preparations in leprosy that the latter is much more effective than the former. Given intramuscularly we have only the general effect of the drug; whereas when injected into the skin lesions the local effect is superadded to the general, and possibly the general effect is increased by this method as will be pointed out later.

It is not difficult to demonstrate the relative effectiveness of the intradermal method, by choosing a patient with marked symmetrical lesions and injecting intradermally the lesions in the one side of the body, leaving those on the other side as a control. While both sides may show improvement, the progress made on the injected side is much more marked.

The question arises, how does intradermal infiltration act in clearing up leprotic lesions?

(1) There can be no doubt that a very important part of the action is due to the local irritant effect of the drug. There is the primary acute effect when infiltration takes place into the intercellular spaces and a more prolonged though milder effect after the esters have been absorbed by the local cells. Sections of infiltrated areas show that esters persist in the cells for many months, and there is clinical evidence that after a single infiltration improvement continues for a very long period.

(2) It has not yet been proved whether hydnocarpus esters produce any special local effect on the *M. lepræ* apart from the counter-irritation caused by their physical properties.

In other words, would another preparation possessing equal absorbability by the local cells and equal irritating power be as effective in its local action? That is a question which it should not be difficult to decide by controlled experiments. To do this patients with marked, extensive, symmetrical lesions should be chosen, lesions of the one side of the body being infiltrated with hydnocarpus esters and those of the other side with the drug to be tested. The attached photographs (figs. 1, 2 and 3) show the effect in a patient whose right side was infiltrated with hydnocarpus esters and the left side with sodium hydnocarbate solution.

(3) The third part of the action of hydnocarpus esters when infiltrated into the dermal

lesions is somewhat hypothetical. The breaking down of lepromata due to the local action of the esters probably leads to the setting free

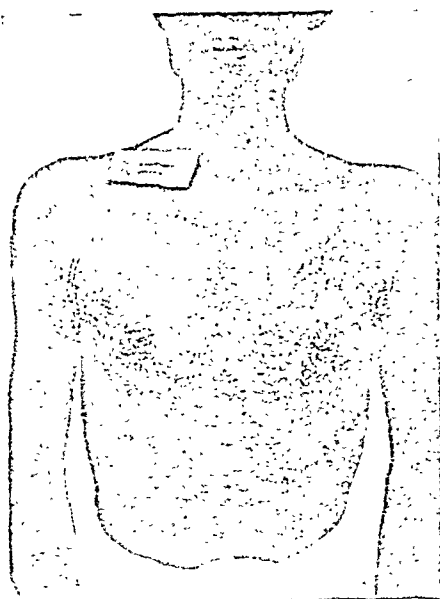


Fig. 1.—Right side was infiltrated with hydnocarpus esters—the left simultaneously with equal doses of 3 per cent. sodium hydnocarbate solution.

in the body of antigens of *M. lepræ* and encourages the formation of antibodies, in other words internal autovaccination is carried out.

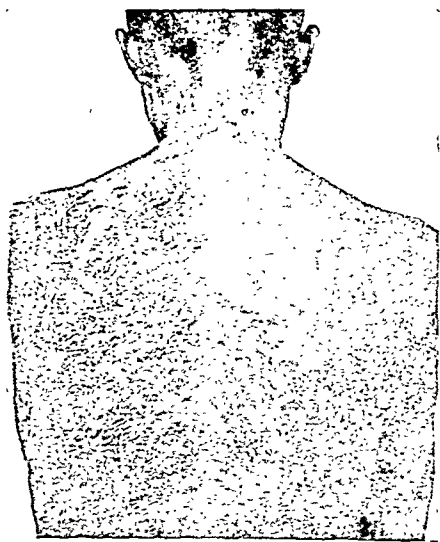


Fig. 2.—Upper part of back of same patient.

Various attempts have been made to treat leprosy by inoculations with suspensions of *M. lepræ*. This form of treatment is rendered difficult by our inability so far to cultivate this organism outside the human body. There is reason to believe, however, that a similar effect

(autovaccination) is secured as one of the several benefits of intradermal infiltration of lepromata.

(4) In common with the intramuscular and subcutaneous routes, intradermal infiltration with esters produces the *general* effect of injecting an irritating substance into the body, which may be distinguished from the *local* effects on the lesions into which the drug is injected. An excessive dose will often cause a febrile reaction even when injected into a healthy person, and there is no doubt that many leprosy patients are markedly benefited by the injection into the tissues of the body of any irritating substance provided the dose be sufficient and not excessive.

(5) The fact that hydnocarpus or chaulmoogra oil and its preparations have become the standard drugs used in the treatment of leprosy predisposes one in favour of the belief that this oil contains some substance which has a curative effect in leprosy, apart altogether

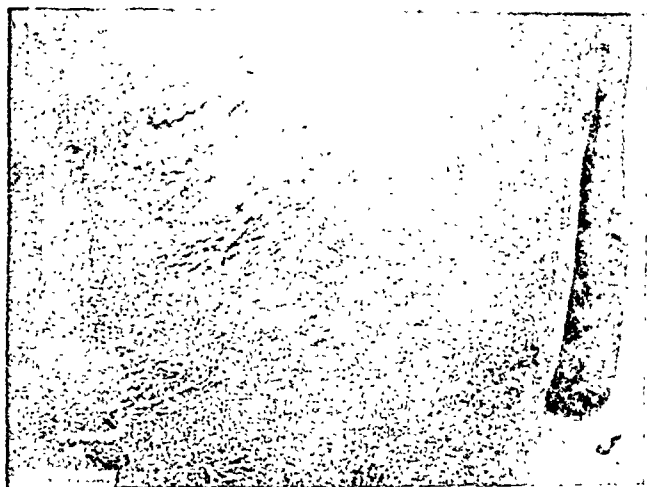


Fig. 3.—Lower part of back.

from the effects mentioned above and which substance is not found in other oils.

It has so far been found impossible to carry out on a large scale a well-controlled experiment which would prove this in a convincing manner. The difficulties in the way of carrying out such an experiment are many:—

(a) In such an experiment it would be necessary to exclude the first four effects of injecting hydnocarpus oil or esters, that is to say if the intradermal method were used; and the third and fourth effects would have to be excluded if the intramuscular route were used.

(b) A mass experiment is not applicable to a disease which does not yield to mass treatment. There can be no doubt that good therapeutic effects in leprosy can only be looked for when each individual case is studied and treated separately. After all the most important part of the treatment is to raise the general resistance of the patient, and this is done largely by dealing with accompanying diseases, errors of diet, harmful habits, etc.

These predisposing causes vary in every case. Thus each case must be studied carefully before treatment begins. Also injections of hydnocarpus have to be regulated throughout the treatment according to the resistance of the patient and according to the effect produced by the previous injection.

(c) A third difficulty in carrying out such a controlled experiment is that progress under any treatment is slow. If injections are given compulsorily, against the will of the patient, then their beneficial effects are apt to be negated to a certain extent by the psychological condition of the patient. Treatment is seldom effective without his willing and intelligent co-operation. On the other hand if volunteers are chosen for such an experiment it is often difficult to get sufficient suitable cases together and to persuade them to undergo treatment for a sufficiently long time. This is especially so in the case of the controls who would have to be injected with some inactive substance which the patient could not distinguish from hydnocarpus.

The form of controlled experiment which is likely to be practicable is to find out a substance, such as the ester of another oil, and, using hydnocarpus esters as the standard, test it out by the intradermal method as to its power to clear up marked lesions. This can be done by the method mentioned in the second paragraph of this paper. Having secured a drug with powers equal to the standard in clearing up local lesions, it should be tested out in a large-scale comparative experiment, every second patient that appears would be treated with the new drug, alternate patients being treated with the standard.

By following out this method many of the objections to an experiment with a neural control are obviated. A number of years would be required to carry out the experiment convincingly, but if the cases treated with the new drug showed results equally beneficial to those shown by the standard, one would be justified in stating that the standard did not contain special beneficial qualities differing from or in excess of those of the new drug.

Technique for giving intradermal injections

The low viscosity of hydnocarpus esters as opposed to hydnocarpus oil makes the former more suitable for infiltration than the latter. The oil however if pure and of low irritating power can be used after heating to about 45°C. to make it as thin as possible. Any needle of medium thickness may be used, but if the esters are used a fine needle is preferable. If many patients have to be treated as is the case in a leprosy clinic we may use a short, guarded needle with a point about 3 mm. in length and a collar which prevents the needle entering further than that distance into the skin. With this needle a practised worker can

give some 100 punctures in a couple of minutes and infiltrate some 5 or 6 c.cm. in an area of some 14 square centimeters. Not more than about 0.03 c.cm. ($\frac{1}{2}$ a minim) should be injected at any one point. The needle should be sloped so that the drug enters the corium, not reaching the subcutaneous tissue except in cases where the subcutaneous tissue is leprotic. On the other hand it should not be injected too superficially into the epithelium. If correctly infiltrated a wheal of about 8 to 10 mm. diameter should at once rise round the puncture as a centre, or at least the skin markings over this area should stand out in marked relief as compared with the surrounding skin. As to what areas of the body surface should be infiltrated it may be stated that all regions of the skin showing deep analgesia are suitable for this purpose. In advanced cutaneous leprosy this may involve almost the whole skin surface. In such cases the spaces between the punctures should be increased so that at each sitting it is possible to cover a fairly large area. In this way, giving infiltrations once or twice a week, it may be possible to cover the whole area of the body in about ten months. On returning to the parts first treated after this period it is generally found that they have improved considerably in appearance and that the deep analgesia has distinctly diminished. Thus on re-infiltration of the skin for a second time more pain is felt by the patient, but he is generally willing to submit to this because of the marked improvement which he himself can notice in his lesions.

In patients with comparatively few macules all the lesions may be infiltrated in a few sittings. Re-infiltration of a lesion should not take place until all induration caused by the former injection has entirely disappeared; this is generally three or four weeks. When the lesions are few and small in size they may all be infiltrated at one sitting and the patient may be told to return after a month's time. Or he may be given weekly intramuscular or subcutaneous injections in the interval until the lesions are ready to be re-infiltrated. In patients with high general resistance and a few early lesions not showing acid-fast bacilli six infiltrations at monthly intervals are generally sufficient to clear them up. When acid-fast bacilli are present a longer course is necessary and weekly injections should be given, these being intramuscular when sites for intradermal injections are not available.

In cases of neural leprosy in which acroteric lesions with glove-stocking anæsthesia are present, infiltration should be given first at the proximal margin of these lesions, working down gradually towards the periphery. As these are ascending lesions the proximal part is the last to be affected and therefore clears up most rapidly on infiltration. Care should be taken in treating the dorsum of the foot to infiltrate

only a small portion of the skin at any one sitting, as, if the patient is walking about, an extensive infiltration is apt to lead to considerable pain and swelling because of the dependent position of the part.

With regard to the drugs used for infiltration it is important that these should be of low irritant quality. The esters prepared at the Calcutta School of Tropical Medicine mixed with 4 per cent. creosote have been found uniformly non-irritating. These esters are prepared from a pure quality of oil. The method adopted by the Culsion Leper Colony as described in the appendix of the report of the Manila Leprosy Conference (*Philippine Journal of Science*, April 4, 1931) is applicable to oils of less purity, the excessive irritant qualities being removed by the process, especially by heating for a definite time at a definite temperature with half per cent. iodine. One of the objections formerly raised to the intramuscular injection of hydnocarpus oil, was that it took a long time to absorb and that in consequence indurated areas or even abscesses were formed which were slow in disappearing.

In the intradermal method delayed absorption is proving an asset rather than a disadvantage, as the slow absorbability of the drug secures its presence in the cells of the infiltrated areas for a long time and the continuation during that period of the beneficial effect; whereas a watery solution like that of sodium hydnocarpate is quickly absorbed. There is evidence that the local effect of a slowly absorbed preparation like the esters in an infiltrated leprous lesion is of much more importance towards the recovery of the patient than the general effect of a form of the drug which is quickly absorbable, such as the watery solution of sodium hydnocarpate: *vide* experiment referred to in (2) and figs. 1, 2 and 3. Hydnocarpus esters have generally been selected as the preparation of choice for intradermal infiltration. The pure oil has generally been considered too viscous or too slow in absorption for the purpose. It has been found however that by heating the oil to about 48°C. before injection its viscosity is considerably decreased, and if not more than 0.03 c.cm. ($\frac{1}{2}$ a minim) is injected at each puncture, the initial reaction caused by the infiltration soon passes off. A simple method of heating the oil to the right temperature is to place it in a separator inside an asbestos-lined box; a thermometer is immersed in the oil and projects through the cork at the top of the separator and through a hole in the top of the box. The outlet and stop-cork of the separator project through a hole in the bottom of the box. The oil is heated by means of an electric bulb placed inside the box alongside the separator or by means of a lamp or gas jet. In countries where many indigent patients have to be treated, and where a good supply of pure oil pressed from ripe

fresh hydnocarpus seeds is available, the advantage of being able to substitute the oil for the esters is obvious. Pure hydnocarpus oil of low irritant quality can generally be obtained in India at one rupee a pound or less.

A comparative experiment is being carried out on the lines indicated above to show the relative values of the oil and the esters, but the result of this is not yet available.

'MERCUROCHROME-220 SOLUBLE' IN LEPROSY WORK

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Introduction

'MERCUROCHROME-220 SOLUBLE', a complex organic preparation of mercury containing from 23 to 24 per cent. of metallic mercury, has been in use practically since 1922. According to Solis-Cohen (1928), Piper seems to have been the first in America to utilize therapeutically the germicidal properties of this preparation, by administering it intravenously in puerperal and post-operative septicaemias. Following the initiative of Piper in America, physicians and surgeons in other parts of the world began to utilize increasingly this mercurial preparation in all septicæmic conditions, and a fairly extensive literature has now accumulated on the use of this preparation. As is the case with so many of the newer organic mercurials and arsenicals, this drug also seems to have been used in various diseases; and with the passage of time the limitations to its use have become apparent.

A close study of all the available literature concerning this drug shows that it acts almost like a 'specific' in *B. coli* infections; and remarkable success has been claimed for it in cases of septicaemia due to *Streptococcus hæmolyticus*, and staphylococcus; but rather disappointing results are reported in cases of gonococcal arthritis in particular. Thus Redewell and Potter (1925), who have used mercurochrome intravenously in 496 cases of gonococcal arthritis, report only 24 cures with mercurochrome alone, which comes to roughly 5 per cent. This evidently means that the drug by itself has practically no value in gonococcal arthritis. The same authors, however, record in the same communication, that they obtained brilliant results in 'complicated' cases of arthritis.

What exactly they mean by 'complicated' is not clear. We take it that they mean arthritis of undetermined ætiology—possibly due to mixed infections.

Also it is now clearly recognized that mercurochrome has got the following advantages over the other mercurials:—

- (i) It is comparatively non-toxic.
- (ii) It is a more efficient germicide.
- (iii) It has a remarkable penetrating power.

In short, it may be said that this preparation approaches Ehrlich's ideal of a *therapia sterilans magna* much more than the other mercurials, organic or inorganic.

A study of the literature on this drug further reveals that in cases of arthritis of obscure or undetermined origin (which form a considerable proportion of our patients in this country, specially in institutions which care for a large number of lepers of different types and stages) it has given fairly good results.

It is a matter of common experience with workers in leper asylums and colonies, in this country, to meet with numerous cases of acute and chronic sepsis, arthritis, myositis, neuritis of leprosy or possibly of non-leprosy origin and vague pains all over the body. In such cases although they may yield to one or other of the many empirical remedies in use at present, still the relief obtained in the majority of instances is only temporary. Even non-specific protein-shock therapy, which has so far been regarded as a panacea in these cases, has failed to give permanent relief. So any remedy which promises to give lasting relief is worth a serious trial.

With this object in view, we tried Mercurochrome-220 soluble in one case presumably of acute sepsis, in a few cases of chronic sepsis, in intractable arthritis, and in vague nerve pains, and our results are recorded in this paper. As will be seen later, in some of these cases at least, almost all of the hitherto advocated forms of treatment had been tried and mercurochrome was used as a last resort.

As we have had the opportunity to treat a few cases of *B. coli* infections also with mercurochrome, such cases are also recorded, to confirm the value of this drug in such cases.

Dosage and method of administration

As suggested by J. H. Hill (1924) and Young (1924), we have used a 1 per cent. solution of the drug in distilled water intravenously. The dosage recommended by the above-quoted authorities was strictly adhered to in the first few cases. But, as the symptoms of mercurialism that appeared after the injection were rather troublesome to deal with and as the febrile reaction to injection which sets in usually within about 4 hours after the injection was fairly high, we thought it advisable to give slightly small doses of the same strength of slightly smaller doses of the same strength of often as we considered it necessary. The results, as will be seen from the clinical reports of the later cases, have amply justified our departure from the recommended dosage. We

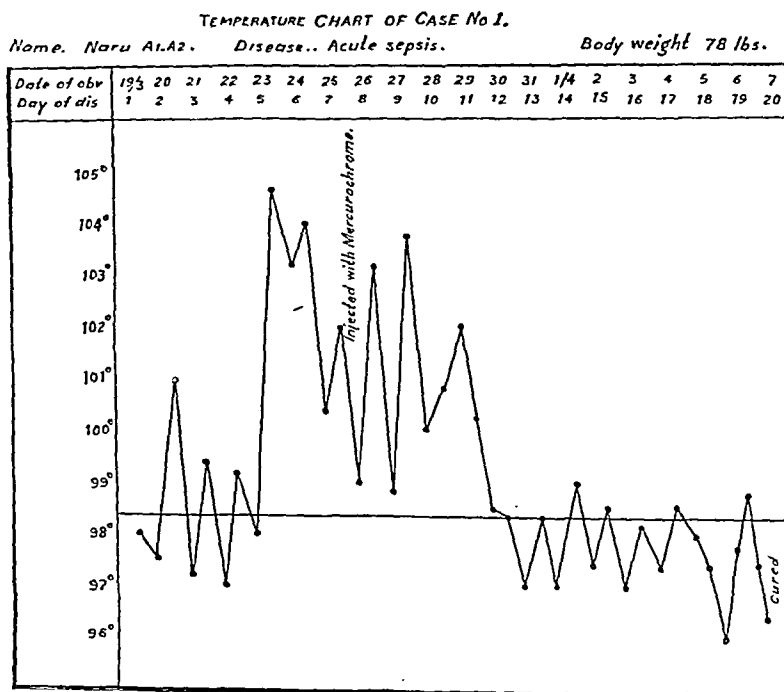
were able not only to achieve practically the same results with repeated slightly-reduced doses, but also were able to avoid the unpleasant symptoms of mercurialism. Thus, while in the first few cases, diarrhoea or stomatitis, either singly or in combination, invariably set in within a few hours after the injection till the second or third day after it, in the later cases, except for the febrile rise which set in within a few hours after the injection, no other unpleasant symptoms were noticed. Even the febrile response to the injection in these later cases was considerably less than in the first few cases, as will be seen from the clinical reports.

It has also to be noted here, in connection with the dosage, that almost all the workers who have reported on the use of mercurochrome seem to have used it only in European and American patients. It is a matter of common knowledge that generally what is recommended as a normal dosage for Europeans or Americans is found to be much more than that suitable for Indians. This is because of the less robust constitution of Indians as compared with Europeans and Americans.

of the 1 per cent. solution for each 100 lbs. of the body weight, should not be exceeded.

Brief clinical reports on the cases treated follow:—

Case 1.—Naru, male, an A1—A2 case of leprosy, weight 78 lbs., was admitted into the hospital on 19th March, 1931, for a small trophic ulcer of the right foot, with fever. On the 5th day of admission, his temperature rose suddenly to 104.6°F. The trophic ulcer was thoroughly examined but it could not be held to account for the high temperature. The blood was examined repeatedly for malarial parasites, with negative results. All other simple laboratory and clinical examinations gave us no help in arriving at a diagnosis. In the absence of a correct diagnosis of the cause of this sudden rise of temperature, no rational treatment was possible. We diagnosed this case provisionally as acute sepsis and thought of having recourse to mercurochrome, more with a view, we confess, to do something for the patient than with any reasonable hope of affording him permanent relief. We gave him intravenously, 20 c.cm. of the 1 per cent. solution of the drug on the 26th March, 1931. About 3 hours after the injection, he vomited once and had two loose motions. On the second day after the injection, the temperature rose again to 103.8°F., after the previous day's remission; and this we considered as the febrile response to the injection. The subsequent behaviour of the temperature has only tended to confirm this opinion. With the subsidence of this febrile response the patient developed stomatitis.



This, then, is probably the reason why we encountered troublesome symptoms of mercurialism and high febrile reactions after administering the drug in what is recommended as a normal dosage in America or Europe.

From our experience, we would recommend that in Indians, at any rate in Indians of less robust constitution than Europeans, a dosage of 0.375 grammes per kilogramme of body weight, which roughly corresponds to about 17 c.cm.

Results.—A mere glance at the temperature chart will show that the result of mercurochrome therapy in this case has been an agreeable surprise.

Case 2.—Gopal, male, an A 2 case of leprosy, weight 87 lbs., had his right leg amputated at the seat of election (at the junction of the proximal third with the distal two-thirds of the leg) by Farabœuf's method. Although the operation was done under strict asepsis, owing probably to the 'run down' condition of the patient, sepsis set in. Long sinuses discharging offensive pus formed, one along the adductor side of the thigh and the other along the lateral side of the thigh,

both the sinuses extending right up to the hip joint. One curious feature of these sinuses was that though they extended up the thigh, through the margins of the popliteal fossa, the knee joint was not involved. These sinuses were opened up and treated on the usual surgical principles for upwards of a month with practically no results. Evidently the patient was fast running down hill. Encouraged by our experience of the use of mercurochrome in the first case and the successful results recorded in such cases in the literature, we gave him an intravenous injection of 20 c.cm. of the 1 per cent. solution of mercurochrome on 26th March, 1931.

Reaction to injection.—The temperature shot up to 104.2°F. in the evening, but it came down as abruptly as it rose. On the third day after the injection, stomatitis set in. No diarrhoea was noticed in this case.

Results.—The temperature came down to normal after showing the febrile response to the injection. The discharge began to decrease gradually and one sinus healed up completely. The other sinus also is almost completely healed. The patient's general condition is much improved. He was discharged cured on the 18th May, 1931.

Case 3.—Suphal, male, a B 3—A 2 case of leprosy, weight 99 lbs., was admitted into the hospital for frequent pains in all joints with swelling of the knees. He had had repeated lepra reactions for a long time. The usual anti-reaction and nerve-pain-relieving treatments had no effect on him. Non-specific protein-shock therapy was also tried, with only temporary relief. It may not be out of place to mention here that non-specific protein shock, induced in this case, caused a very prolonged febrile reaction, the temperature once actually rising to 107°F. But in spite of such a severe reaction, he got only temporary relief. We decided to try mercurochrome in this case; and he was given intravenously 20 c.cm. of a 1 per cent. solution of the drug.

Reaction.—Within a few hours of the injection, diarrhoea and vomiting set in. The temperature rose up to 102.8°F. He also complained of a burning sensation all over the body.

Treatment adopted for the reaction:—Cold sponging and adrenalin 3 minims in 1 c.cm. of normal saline injected subcutaneously and aspirin 10 grs. orally at bed-time. On the second day after the injection stomatitis and pain in the submaxillary glands were complained of. On the third day the temperature reached normal. On the fifth day the pain in the submaxillary gland disappeared and the stomatitis was getting less. He was finally discharged cured on 16th April, 1931. Until now (more than four months) his pains have not recurred, and he is quite well.

Case 4.—Bhagwan, male, a B 2—A 2 case of leprosy, weight 89 lbs., was admitted into the hospital for chronic neuritis of the ulnar and peroneal (superficial) nerves, which were not much thickened nor bound down by any fibrous adhesions, as they were freely movable, and for pain in the joints especially the elbow joints. All the anti-neuritic treatments except nerve stretching were tried, without giving him permanent relief. As he was having recurrent attacks of severe neuritic pains, we gave him mercurochrome as a trial. He was given intravenously 16 c.cm. of a 1 per cent. solution of the drug on 21st April, 1931.

Reaction.—Shortly after the injection, the temperature rose to 102°F. and it came down the next morning.

On the fourth day after the injection, nerve pains and joint pains recurred and he continued to have these pains every day. We thought of giving him a second dose as a first dose apparently failed to give him lasting relief. So he was given 21 c.cm. of the 1 per cent. solution on 28th April, 1931 (i.e., just a week after the first injection).

Reaction.—This time also he had a sharp rise of temperature (to 103°F.) within a few hours after the injection, but it came down the next morning as usual.

Results.—All his pains completely disappeared on the third day after the second injection and till now

(four months) have not recurred. The patient feels that he has permanent relief now.

Case 5.—Gaurmani, female, an A 2 case of leprosy, weight 96 lbs., was admitted into the hospital for long-standing pain in the right knee joint. She had had the usual anti-neuritic and sodii-salicylas treatments, several times, with only temporary relief. She was given 20 c.cm. of the 1 per cent. solution of mercurochrome intravenously.

Reaction.—As usual, within a few hours of the injection, she had a rise of temperature. She began to show stomatitis also which disappeared after the fourth day of the injection.

Results.—Complete relief from pain in the knee joints, with no sign of recurrence so far.

Case 6.—Dasarath, male, a B 1—A 2 case of leprosy, weight 89 lbs., was admitted into the hospital for a sloughing ulcer on the dorsum of his right foot. The whole foot was tender. The ulcer was evidently extending upwards. The whole leg up to the knee joint was swollen and there was some fever also. He was treated with Eusol baths and black wash for about three weeks, with no improvement. So it was decided to give him mercurochrome and he had 22 c.cm. of the 1 per cent. solution intravenously.

Reaction.—As usual, there was a rise of temperature, which lasted for two days. Purging, once or twice, and stomatitis were the other signs of reaction noticed in this case.

Results.—Subsequent dressings with Eusol were continued as usual (as a routine) and these dressings helped to cure him, although they failed to do so before the mercurochrome was given. We believe that the mercurochrome had a lion's share in the recovery of this patient.

Case 7.—Ramlal Rajbehari, male, an A 2 case of leprosy, weight 79 lbs., was admitted into the hospital for long-standing gonorrhoeal arthritis of the knees and wrists, and teno-synovitis of the hands and feet. He had two full courses of gonococcal vaccine (polyvalent) with only temporary improvement. Subsequent to this he had non-specific protein-shock therapy, which also gave him only temporary relief. We decided to give him mercurochrome as a last resort. He had 15 c.cm. of the 1 per cent. solution of the drug intravenously on 17th April, 1931.

Reaction.—Within a few hours after the injection, he began to pass several loose motions, and had vomiting also. The temperature, as usual, rose to 102.8°F. On the third day after the injection, he developed stomatitis.

Results.—Four days after the injection, he had relief from all his pains. He was therefore discharged from the hospital on 23rd April, 1931. But after 25 days, he had a recurrence of his pains, and so was readmitted into the hospital on 19th May, 1931. He was given a second injection of mercurochrome, 15 c.cm. of the 1 per cent. solution intravenously.

Reaction.—Within a few hours after the injection, as usual, he had a febrile reaction with vomiting twice and the two loose motions. Mild stomatitis was also in evidence. This lasted for a few days.

Results.—After this injection, he has had complete relief; and so far (four months now), there has been no recurrence. In this case, obviously, an insufficient dosage was the cause of the recurrence; but full doses could not be given for fear of provoking severe and unbearable reactions. This case lends full support to our opinion expressed in the introductory part of this paper that repeated slightly smaller doses practically give the same results as the full doses recommended, without producing severe febrile reactions, and the very unpleasant symptoms of mercurialism.

Case 8.—Kalipada, boy, aged 14, a B 2 case of leprosy, weight 57 lbs., was admitted into the hospital for long-standing pain in the knee joints and shins. He used to get occasional lepra reactions. He was given 14 c.cm. of the 1 per cent. solution intravenously. The temperature rose to 104.6°F., within a few hours after the injection, and he had severe stomatitis, which lasted for a fortnight or so.

Results.—Pain in the knee joints and shins completely relieved.

Case 9.—Madram, male, an A 2 case of leprosy, was admitted into the hospital for long-standing lumbago which did not yield to the other usual methods of treatment. He was given intravenously 17 c.cm. of the 1 per cent. solution on 20th May, 1931.

Reaction.—As usual, within a few hours of the injection, the temperature rose to 100.6°F., but it came down to normal at 10 p.m. the same day. He had slight stomatitis, which disappeared after three or four days.

Results.—Complete relief was obtained. There has been no recurrence of the pain so far (4½ months).

B. coli infections

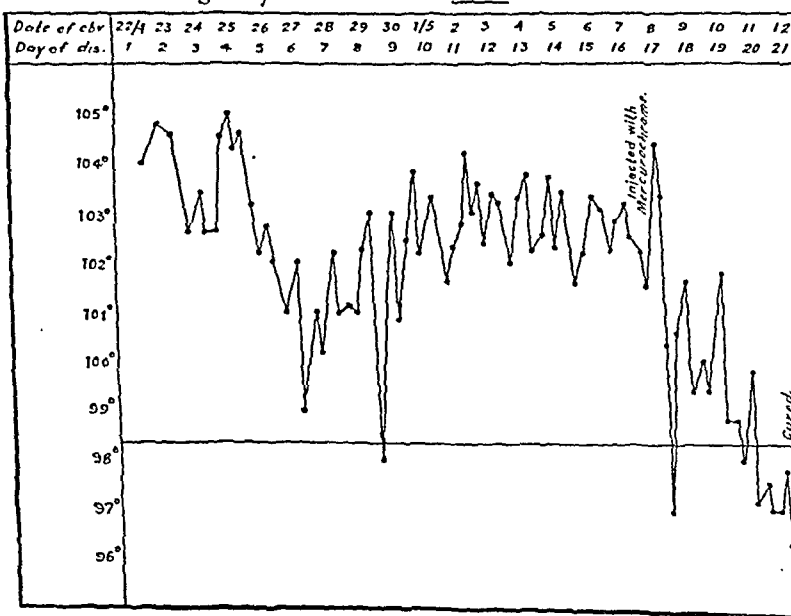
Case 10.—Martha, weight 44½ lbs., a healthy girl aged 11 years and an inmate of the healthy girls' home, was suddenly taken ill with a sharp rise of temperature to 103°F. on 22nd April, 1931. The fever continued with slight remissions for a fortnight or so. There were no other signs to justify a diagnosis of

subnormal the very same night at about 10 p.m. No other signs of reaction were noticed.

Results.—The fever gradually came down to normal within the course of the next week. A single injection was quite sufficient in this case to bring down the temperature and to give complete relief from the other symptoms.

Case 11.—Mercy, a girl of 17, had a sudden attack of fever on the 25th April, 1931. The temperature at 6 a.m. on that day was 103°F., and it continued with more or less remissions for a period of 13 days. As in the previous case, there were no other signs or symptoms diagnostic of either typhoid or any of the other long-continued fevers. Repeated examinations of peripheral blood smears proved negative for malarial parasites or leishmania. No definite cause for this long-continued fever could be found. The urine was examined, and found to be highly acid with very actively-motile bacilli in it, which, on staining, proved to be Gram negative and identical, morphologically, with *B. coli communis*. A diagnosis of *B. coli* infection was made, and she was given

TEMPERATURE CHART OF CASE No. X.
Name. Martha. Age.. 11 years. Disease.. *B. coli* infection.



typhoid or paratyphoid. Repeated examinations of the peripheral blood smears did not throw any light on the cause of this long-continued fever. The urine was examined and found to be highly acid, with some very actively-motile bacilli in it. These bacilli were found to be Gram negative and were morphologically quite similar to *B. coli communis*. In the absence of full laboratory facilities, a diagnosis of *B. coli* infection had to be based on the high acidity of the urine, absence of any casts, and the presence of a fairly large number of very actively-motile bacilli which, on staining, proved to be Gram negative. It may also be noted here that the urine was collected under conditions which, though not strictly aseptic, can still be claimed as something approaching that. The temperature chart of this case, as it is of interest, is reproduced here.

The very favourable reports in the literature on the so-called specificity of mercurochrome in *B. coli* infections encouraged us to try it in this case; and accordingly we gave her intravenously 5 c.cm. of the 1 per cent. solution on 8th May, 1931.

Reaction.—As usual, within a few hours of the injection the temperature rose to 104.4°F., and there was one loose motion. The temperature came down to

intravenously 7.5 c.cm. of the 1 per cent. solution on 13th May, 1931.

Reaction.—As usual, within a few hours of the injection the temperature rose to 103.4°F., and came down to normal the next morning. There was only one loose motion. No other symptoms or signs of mercurialism were noticed.

Results.—The temperature came down to normal and has been normal so far. She is quite well now. In this case also, a single injection was quite sufficient to bring down the temperature to normal.

Case 12.—Jhifrid, a healthy boy aged about 11 years and an inmate of the healthy home, was suddenly taken ill with a sharp rise of temperature to 103°F. The fever continued for a week, with slight remissions. Examinations of peripheral blood smears were repeatedly negative for malarial parasites. There were no other signs or symptoms pathognomonic of any other disease. His urine was examined and found to be highly acid, with some very actively-motile bacilli in it, which, on staining, proved to be Gram negative and morphologically quite similar to *B. coli communis*. A diagnosis of *B. coli* infection was made on the strength of our experience of the two above-reported

cases; and he was given intravenously 5 c.cm. of the 1 per cent. solution.

Reaction.—As usual, there was a sharp rise of temperature to about 104°F. within a few hours of the injection, but the temperature subsequently came down to 101°F., and remained practically at that level for three days.

As the temperature did not come to normal as we expected he was given intravenously 5 c.cm. of the 1 per cent. solution five days after the first injection.

Reaction.—This time also, the temperature rose to 104°F. within a few hours of the injection, and mild stomatitis was noticed on the next day. On the second day after this injection, the temperature came down to normal and has remained normal ever since then.

Results.—The patient recovered completely. In this case it is noteworthy that two injections had to be given to bring down the temperature to normal. Possibly this was a fairly severe type of infection; or probably the smaller dose of mercurochrome than that which is usually advocated, used by us, necessitated a second injection.

Discussion

A comparison of the body weight of the cases reported and the doses of mercurochrome given to them will show that, except for the three or four cases who received the full recommended doses, the others had slightly smaller doses. Although all the cases have shown some sort of reaction to the drug, the later cases (*i.e.*, those who received slightly-reduced doses) showed only mild symptoms of mercurialism, and the febrile response in these cases was comparatively milder. A constant feature of all these cases seems to be the febrile response to the injection, which though variable in its extent, and of short duration, still seems to be inevitable or unavoidable. In some cases, one injection has not had much beneficial effect, but a second injection has given the desired relief. In the three cases of *B. coli* infection the first two cases yielded to a single injection, whereas the last case required two. A comparison of the dosage of mercurochrome in these three cases shows that though the proportion of the dose to the body weight was the same still the third case required two injections; and this can reasonably be attributed to the severe type of infection in this case. It may be questioned whether the relief obtained in cases of arthritis and vague pains could not reasonably be attributed to their having syphilis, mercurochrome acting on the underlying syphilitic factor. To this our answer is that, excepting case 8 who has shown a ++++ Kahn reaction, all the others are completely negative and therefore the improvement noticed in these cases cannot be ascribed to the anti-syphilitic action of mercurochrome.

Summary and Conclusions

(1) The results of mercurochrome therapy in twelve cases are recorded in this paper.

(2) Of these twelve cases, one was presumably a case of acute sepsis, two of chronic sepsis, three of *B. coli* infections and the rest of arthritis, neuritis and vague pains.

(3) Some cases obtained complete relief after a single intravenous injection of mercurochrome, whereas others required two.

(4) Cases who have received the usually recommended dose (*viz.*, 0.5 milligrammes per kilogramme of body weight) have shown a fairly high febrile response to the injection, and troublesome symptoms of mercurialism.

(5) On the other hand, those who have received slightly smaller doses (*i.e.*, roughly corresponding to 0.375 milligrammes per kilogramme of body weight) have shown comparatively milder febrile reaction and very mild symptoms of mercurialism.

(6) The latter cases also have practically shown the same results as the former, and hence the conclusion that repeated smaller doses of mercurochrome are as effective as the single higher dose.

(7) From the brief clinical reports of the cases recorded in this paper, it becomes obvious that in Indians who are less robust than Europeans or Americans a dosage which corresponds to 0.375 milligrammes per kilogramme of body weight cannot be exceeded without producing fairly high febrile reactions and severe symptoms of mercurialism.

(8) Although it is hazardous to base conclusions on so small a series of cases, still we believe that mercurochrome has a definite place in the treatment of *B. coli* infections, and in cases of acute and chronic sepsis, arthritis of undetermined origin and vague nerve and muscular pains. When all other remedies fail in these cases, mercurochrome should be given a trial.

Acknowledgments

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A PRELIMINARY NOTE ON THE ACTION OF THE ALKALOID OF MORINGA PTERYGOSPERMA (N. O. MORINGÆ)

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Moringa pterygosperma is a common tree which grows wild in the sub-Himalayan tracts

from the Chenab to Oudh and is also cultivated in many parts of India and Burma. It is known in Hindi as *sahjna* or *sajina*, in Bengali as *mumigha*, in Marhatti as *shegva* or *shegat*, and in Tamil as *murungai*. The tree produces flowers and fruits in abundance two or three times a year. The fruit is light brown when ripe, a foot or more in length, triangular, ribbed and composed of three valves containing a soft white pith and a single row of from 12–18 seeds which are dark brown, roundish and the size of a pea. From the tree a gum exudes which is at first white and opaque, becomes pink on exposure to air, and finally turns to a dull red colour on the surface, the interior remaining white. The bark of the root has a reticulated, light-brown, external surface; it is thick, soft and white internally, and has a pungent odour and taste resembling horse-radish.

Many parts of this plant are used in Hindu medicine. It has frequently been mentioned in Sanskrit works such as Bhavaprakasa and Chakradatta. Almost all parts of the plant, especially the roots, leaves, seeds and bark, have been used in the treatment of different ailments. Bhavaprakasa mentions two varieties of the tree, a white variety and a red variety, the latter being probably *M. concanensis*, Nimmo. The oil expressed from the seeds is used externally in relieving pains of the joints in gout and in acute rheumatism. It has a specific gravity of 0.912 to 0.915 at 60°F., and is devoid of odour and flavour; it saponifies readily and does not turn rancid. It is one of the best lubricants for finer types of machinery, such as that of watches. A decoction made from the roots is used for the treatment of ascites and enlargement of the spleen and liver. The root of the young tree is prescribed in the treatment of intermittent fever, epilepsy, hysteria, dropsy, etc. The gum has also been used in the Punjab against rheumatism and as an astringent. The young leaves are used as food. The Mohammedan physicians use the fruit in affections of the liver and spleen, joint pains, paralysis, leprosy, etc. The flowers are used as a food; boiled with milk they are used as an aphrodisiac.

Chemical composition.—The chemical examination of the bark was carried out by Dr. S. Ghosh and Mr. Ashutosh Dutt of the Department of Chemistry. The bark contains small quantities of an essential oil having a very pungent odour. It also contains 0.105 per cent. of alkaloidal bases which are pharmacologically active. This latter portion consists of two alkaloids at least, a crystalline base which is comparatively less active, and an amorphous alkaloid which seems to bear most of the physiological activity. None of these alkaloids give the chemical and physical tests for ephedrine. Further work on the chemical composition is in progress.

Pharmacological action.—The alkaloids of *Moringa pterygosperma* closely resemble ephedrine in action. They have no irritant action locally. Subcutaneous or intramuscular injections of a 5 per cent. solution produce no local inflammation. Local application of a few drops of a 1 per cent. solution dropped into the eyes of a rabbit has no irritant effect on the conjunctiva, nor does it produce local anaesthesia; the pupils show slight dilatation.

Five milligrammes of the hydrochloride of the crude alkaloids injected intramuscularly in a cat produce a well-marked and persistent rise of blood pressure. After about 10–15 minutes the blood pressure comes down to normal, but does not as a rule go below its normal level. The pressor action resembles that of ephedrine though it does not appear to be so strong. The pulmonary blood pressure is slightly increased. In an isolated mammalian heart a dilution of 1 in 100,000 of the hydrochloride produces a marked increase in the amplitude of contractions, the rhythm of the beat being also accelerated. The coronary outflow is increased. Unlike ephedrine, which in large doses has a depressant action on the myocardium, these alkaloids in large repeated doses produce no depressant effect on the musculature of the heart.

On the blood vessels the action of the hydrochloride closely resembles other sympathomimetic bases such as adrenalin and ephedrine. It produces a contraction of the blood vessels by stimulation of the vaso-constrictor nerve endings.

Intravenous injections of the hydrochloride produce a well-marked dilatation of the bronchioles. The peristaltic movements of the intestine are inhibited and the general tone of the involuntary muscles is decreased. These effects are undoubtedly due to stimulation of the sympathetic fibres. The liver appears to have a detoxicating action on this alkaloid, as injections into one of the mesenteric veins do not produce the usual pharmacological effects. The secretion of the kidney is somewhat increased. The isolated uteri of the guinea-pig and the rabbit react by contraction in 1 in 50,000 dilutions.

Discussion.—The therapeutic uses of ephedrine as a cardiac tonic in the treatment of asthma and other conditions are well known and it will not be necessary to recount them here. The presence of an alkaloid closely resembling ephedrine in action in *Moringa pterygosperma*, a plant used largely in the Hindu medicine, is an important finding. This plant has a wide distribution in India and the alkaloid could be extracted from it without much difficulty.

It is also interesting in this connection to note that sympathomimetic alkaloids occur in other commonly-growing plants in India. Chopra and De (1930) have shown that *Sida*

cordifolia, a plant which is widely distributed throughout the tropical and sub-tropical parts of India and Ceylon, contains ephedrine. It is true that the whole plant on analysis gave only 0.085 per cent. of the alkaloid, but the seeds were found to contain about four times as much, i.e., 0.4 per cent. of the active principle. Ephedras which yield 2 to 3 per cent. of ephedrine and pseudo-ephedrine grow in India in rather inaccessible places from the point of view of transport. In *Sida cordifolia* we have a readily-available source of ephedrine; this plant could easily be cultivated anywhere and large crops could be gathered for extraction of ephedrine. It is also possible that by proper cultivation the yield of the alkaloid from the plant as well as from the seeds could be materially increased. We suggest that experimental work might be undertaken in this direction.

Summary and Conclusion

The alkaloids obtained from *Moringa pterygosperma* closely resemble ephedrine in action. The hydrochlorides of the crude bases stimulate the sympathetic nerve endings all over the body. They have a stimulant action on the heart; they constrict the blood vessels and produce a marked and persistent rise of blood pressure; they relax the bronchioles, inhibit the tone and movements of the intestines, and produce contraction of the virgin, as well as the pregnant, uteri of guinea-pigs and rabbits.

These alkaloids are likely to be useful as a cardiac stimulant and in the treatment of such conditions as asthma.

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CYTOLOGICAL STUDIES OF THE BLOOD AND TISSUES IN KALA-AZAR AND ASSOCIATED CONDITIONS

Part II*

MORPHOLOGY OF THE LEUCOCYTES IN SUPRA-VITAL PREPARATIONS

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BEFORE undertaking any investigation regarding the occurrence of abnormal cells or variations in the relative proportion of the cellular elements of the blood in abnormal or diseased

states of man and animals, it is essential that the worker should adopt a definite nomenclature and have in his mind a clear picture of the differential characteristics of the various cell groups which he proposes to examine. Extensive as the literature on the cytology of the blood is, it is not an easy matter to find clear-cut descriptions of living blood cells as seen in supra-vital preparations of normal and abnormal blood. Even pioneers in this work, such as Sabin, have at times found it necessary to re-adjust some of their standards, specially with reference to the mononuclear cells, and hence before proceeding to discuss the results of our cytological studies in certain protozoal diseases it seems desirable to record our description of the blood leucocytes in supra-vital preparations giving the nomenclature that we have adopted and the characteristics that we have utilised for purposes of identification.

Although we have studied the supra-vital characteristics of leucocytes in several hundreds of specimens of blood obtained from men and animals, healthy as well as diseased, in this paper we propose to confine ourselves chiefly to a description of the normal leucocytes of man. Morphological and other variations from normal noticed in certain diseased states will be dealt with in subsequent papers; in this only brief references to them are made. As regards abnormal forms of leucocytes a description of the histiocyte and the myelocyte are given, the former because we are particularly interested in it at the present time and the latter because it has been mistaken for the histiocyte, on many an occasion and by more than one observer. Finally, regarding the characteristics of leucocytes of different species of animals examined by us we are saying little, for it appears to us that they are in the main similar to those of man. A table showing variations in the relative proportions of the different leucocytes in different animal species is alone given.

DESCRIPTION OF LEUCOCYTES

The polymorphonuclear neutrophilic leucocyte

The shape of this in supra-vital preparations is strikingly different from that seen in fixed stained films. Depending upon the quality of the preparation it is present in one of three forms, the motile, the resting, or the rounded form. The *motile form* is large, amœboid and active, and can be seen in all good preparations. Its movements at times are so very rapid that one cannot possibly make an accurate camera lucida drawing of it. The *resting form* is amœboid in appearance like the first, but is distinctly smaller in size and practically devoid of motility. Even in the most carefully-prepared specimen a certain number of these are generally seen. They do not seem to be dead for when observed for a sufficient length of time under the warm stage some of them may

* Part I, on the technique of the supra-vital method of staining has been completed and will appear shortly.

be noticed suddenly starting to move again with almost the same rapidity as the motile form. The *rounded form* is similar to that seen in fixed films and is commonly met with in bad preparations; its presence in this form indicates that the cell has been damaged or killed by excess of stain, heat or pressure, or is dying. The presence of any number of these forms is an almost certain indication of the unsatisfactory nature of the preparation. We have watched on several occasions the process of cell death in the polynuclear leucocyte and have found the following sequence of events; the cell takes up more stain, its power of locomotion diminishes, it assumes a rounded form, its protoplasmic granules start dancing violently, and, finally, either the cell ruptures discharging the granules or assumes the form seen in fixed preparations.

The protoplasm of the polynuclear leucocyte consists of a hyaline exoplasm which forms the advancing pseudopodium, and a liquid endoplasm containing many fine, faintly-staining, refractile granules. In addition, in a certain number of the cells, one or more vacuoles of varying size may also be seen. These segregate the neutral red and are quite prominent when present. When more than one is present they may coalesce to form a single large vacuole. To us it looked as though the vacuoles were best seen when the cell was resting or about to round up.

The nucleus in a motile cell is always unstained and is placed posteriorly. Its shape and position will be seen to change during locomotion. In a resting cell the nucleus occasionally assumes the form of a horse-shoe; when these forms show a mass of neutral-red-staining refractile granules in their cytoplasm they simulate closely the larger forms of monocyte. But one feature which we found helpful for differentiation purposes was the colour of the granules and the cytoplasm. Whereas in the polynuclear leucocyte the granules are refractile and faintly pink, they are relatively dull and orange coloured in both the monocyte and the histiocyte. The cytoplasm of the latter in contrast to that of the polynuclear is also characteristically bluish green.

In pathological conditions, such as pneumonia and dysentery, and after injection of antimony in kala-azar and dermal leishmaniasis one important change that is sometimes noticed in these cells is an increase in the number of vacuoles. What the real significance of this increase in vacuoles may be we are unable to state; but if, as Sabin (1923) presumes, they are an indication of the functional phagocytic activity of the cell, then the significance of our finding is that in the conditions studied by us there was functional stimulation of these cells.

The eosinophilic leucocyte

This is perhaps the most striking cell in supra-vital preparations and can easily be

distinguished from all others. Its large size, amoeboid shape, active motility, together with the presence of large numbers of coarse, deeply-staining, refractile granules in its liquid cytoplasm are all quite characteristic. Compared with the neutrophile leucocyte, it is less amoeboid and less motile. It will be seen moving only for a shorter time. The nucleus is generally two-lobed and when the cell moves the lobes are dragged far apart and a thin thread connecting the two lobes becomes visible. We have not observed any vacuoles in these.

In pathological conditions, such as urticaria, dermal leishmaniasis, and the coccidiosis of rabbits, we have seen variations from the normal type, as regards staining, colour, number and size of granules, character of nucleus and size of cell, but we have had no occasion to attempt to correlate any of these findings with any special state or function of the cell.

The lymphocyte

This occurs in one of three sizes, small, medium or large, and is the easiest cell to recognise. Its round shape, large nucleus with massive blotches of chromatin in it, and glassy clear cytoplasm, containing numerous bluish-green, refractile mitochondria are very characteristic. The nucleus which in a fixed stained film is invariably round is only occasionally so in the living condition. It has in most cases one or more indentations which give it a kidney or an irregularly-round shape. The cytoplasm, in addition to the above structures, may show a few neutral-red vacuoles. It is not common to find the cell in motion, but occasionally one sees a cell in a form that suggests that it may at times throw out a blunt pseudopodium.

In normal blood, as already stated, the chief character of the cytoplasm of the lymphocyte is the presence of numerous blue-staining mitochondria and absence of any neutral-red vacuoles. In certain pathological conditions, as for example following the injection of antimony in kala-azar cases, cells closely answering to a description of lymphocytes, but showing a fair number of neutral-red granules in their cytoplasm, may readily be seen. At times difficulty arises in differentiating these cells from the small forms of monocytes. The neutral-red particles in these forms do not generally clump to form a rosette, but when they do the cell cannot be distinguished from the monocyte. What cell types these forms really represent (monocytes or lymphocytes), we are not certain, but their presence may be interpreted as supporting the view that, under certain abnormal conditions in which there is a great demand for monocytes, these may originate from tissues other than those that normally produce them. Here it is interesting to record that the lymphocytes of the leukæmic

blood show no tendency to pick up neutral-red granules and simulate the monocytes.

The large mononuclear leucocyte

Recently, with the help of the supra-vital staining technique Sabin, Doan and Cunningham (1925) have shown that the 'large mononuclear' leucocytes of the blood and of the connective tissue which compose the so-called reticulo-endothelial system, consist of two distinct cell types called the 'monocytes' and 'histiocytes'. The basis for this separation has not only been morphological, but also 'derivational, developmental and functional'. Therefore, we thought that it would be best to adopt their nomenclature and to describe the two cell-types separately under their respective names.

The monocyte.—This is the type which has been described by Ehrlich as 'large mononuclear leucocyte' and 'transitional leucocyte'. It is present always in normal healthy blood and its appearance is quite characteristic and facilitates its differentiation from other cells with great ease. It is of slightly larger size than the lymphocyte which it closely resembles, it has a big kidney-shaped nucleus with a deep and distinct indentation or *hof*, and it shows the presence of a 'rosette' or clump of uniformly-fine neutral-red particles surrounded by a number of refractile, blue-staining mitochondria in its cytoplasm. Occasionally, one or two neutral-red vacuoles of varying size may also be present at the periphery. Except for short bleb-like pseudopodia thrown out at times by it, we have not seen any sign of active movement. The most useful characteristic for purposes of identification of the cell is the distribution of the neutral-red particles in the form of a 'rosette'. This characteristic is always noticeable in the monocytes of normal blood and is one of great help in recognising the cell. In certain bad preparations the rosette sometimes gets broken up and the dye particles diffusely distributed all over the cell. This makes it necessary to emphasize the need for conducting supra-vital studies on good preparations and under optimal conditions.

In pathological and experimental conditions great variations from the normal type, as regards the size, nature and distribution of the granular inclusions, and the character of nucleus, occur. These variations cause some difficulty in identifying the forms from the histiocyte when the latter is of moderate size and shows fewer fine neutral-red particles. We have observed all grades of intermediate forms between the typical monocyte to the typical histiocyte as well as dividing forms of monocytes, after the introduction of various forms of stimulus in certain pathological and experimental states. Whether the intermediate forms showing an excess of the dye represent stimulated monocytes with increased phagocytic

capacity (the view we hold), or younger forms of histiocytes, it is not easy to state, but their presence may be taken as evidence in support of the view that monocytes and histiocytes are but different phases in the life history of one and the same stem cell, and that the former may, under suitable environmental conditions or functional stress, gradually hypertrophy and undergo individual transformation into the latter.

The histiocyte.—To begin with, a word of explanation seems necessary for using the term 'histiocyte'. Different investigators have called the histiocyte by different names, and one finds in the literature a profusion of varied and often misleading terms used to designate these cells. Thus, both Metchnikoff and Evans have called them 'macrophages', Ranvier has called them 'clasmatoocytes', Mallory 'endothelial leucocytes', Marchand 'adventitial cells', Renaut 'rhagiocrine cells', Maximow 'resting wandering cells', Goldmann 'pyrrhol cells', and Aschoff and Kiyono 'histiocytes'. Of all these names the term clasmatoocyte, first used by Ranvier and later by Sabin and Doan, has somehow become the most popular; but, in view of the recent arguments advanced by Maximow (1928) against the adoption of this term and of the increasing evidence regarding the nature, origin and distribution of these cells, the term histiocyte given by Aschoff and Kiyono seems to us to be the most appropriate. Therefore we prefer to use the term histiocyte in place of the possibly-more-popular term clasmatoocyte. As the histiocyte has a very wide distribution and may possibly present differences in structure or function in different situations it would be best to qualify the term by prefixing to it the name of the tissue in which it is found and call it 'blood histiocyte', 'spleen histiocyte', 'connective tissue histiocyte' and so on, and thus specify the exact group to which reference is made.

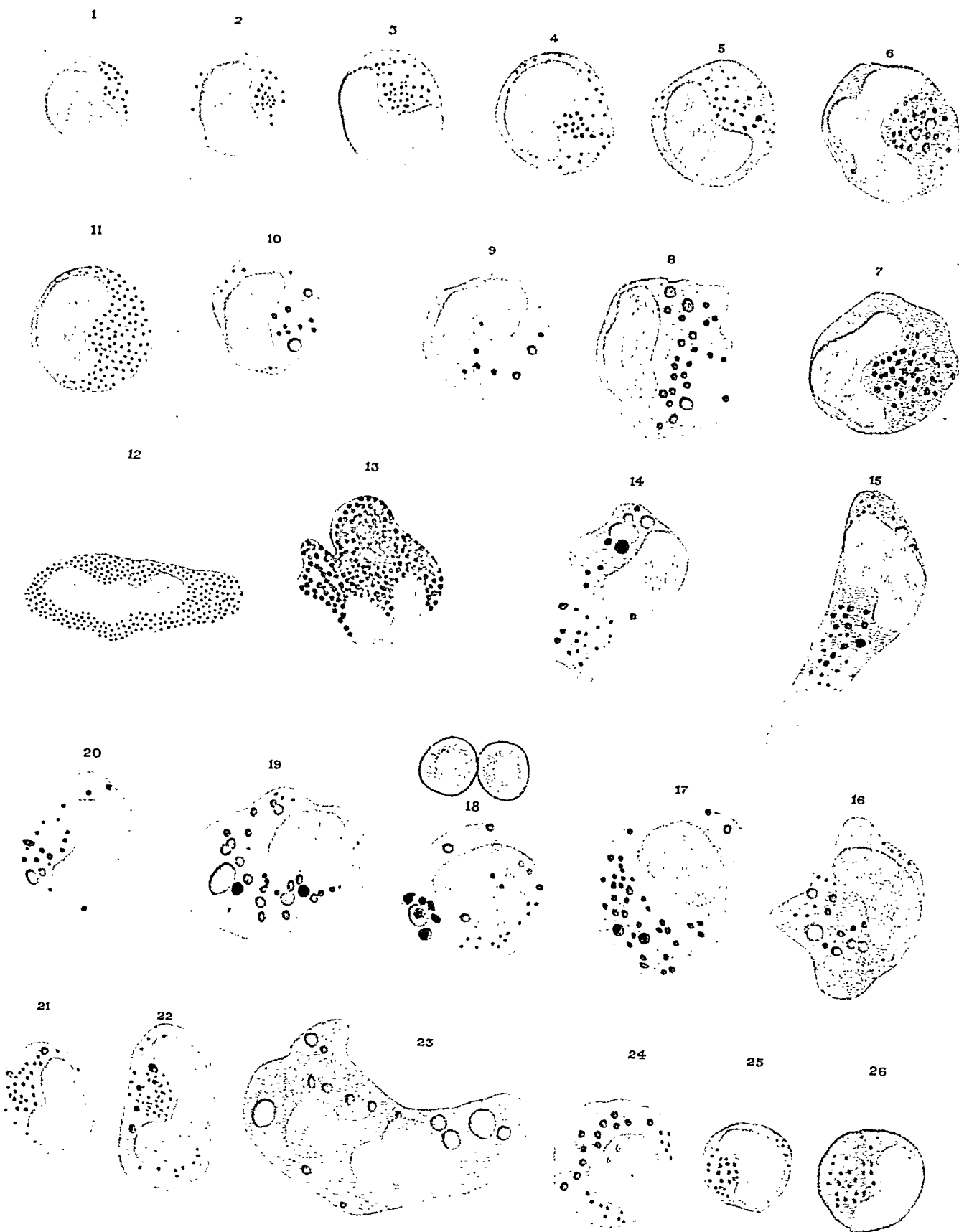
It is generally believed that histiocytes do not occur in the peripheral blood of normal persons, but recently Sabin and others have suggested that they are normal constituents of it. We have during our studies met with a cell or two in the healthy human blood, which we thought resembled the histiocyte. Whether these are true blood histiocytes or forms of monocytes simulating them, it is difficult to say. But as for the presence of histiocytes in the blood in pathological and experimental conditions, there is no question; for not only have we seen them in both men and animals but they have been reported by many other observers. In man, histiocytes have been reported in the peripheral blood by Mallory (1898) and MacCallum (1903) in typhoid fever; by Pappenheim (1900 and 1901), Bushnell (1903), Schilling (1919) and Mulligan (1929) in malaria; by Kommerer and Meyer (1907), Ehrlich, Eason (1908) and Bittorf (1920) in

DESCRIPTION OF PLATE.

All the cells in this plate were drawn with the help of a camera lucida while they were in a living condition in our supra-vital preparations, and subsequently coloured by the artist who used the microscopic specimen as a guide. They are all drawn to the same scale, and, for comparison, red blood corpuscles are shown in the centre of the plate. All the cells depicted are of human origin, figures 1 to 22 being from peripheral blood and 23 to 26 from spleen puncture material.

- (1) A lymphocyte, showing mitochondria and a few neutral-red granules in its cytoplasm.
- (2—5) Monocytes from normal blood showing mitochondria, and a rosette made up of neutral-red granules of small but uniform size.
- (6 & 7) Probably stimulated monocytes (our intermediate type) from a case of malaria after the administration of quinine. The presence of mitochondria, the deep 'hof' of the nucleus, the greater number of large neutral-red granules, and the characteristic arrangement of these in the form of a rosette may all be noticed.
- (8) A histiocyte from a case of kala-azar. The character of the nucleus, the absence of mitochondria, and the diffuse distribution of the large neutral-red vacuoles are seen. An idea of the phagocytic capacity of this cell is also obtained.
- (9 & 10) Probably small histiocytes. No. 10 shows a few mitochondria. The large neutral-red vacuoles and their diffuse arrangement are characteristic.
- (11) A myelocyte from a case of malaria—the uniform small size of the granules, and their regular arrangement are characteristic. The nucleus is shown in the plate deeply coloured but in the actual preparation this is very light or almost colourless.
- (12) A polynuclear neutrophilic leucocyte drawn while in active motion.
- (13) An eosinophilic leucocyte drawn while in active motion.
- (14 & 15) Histiocytes from a case of malaria 24 hours after the commencement of treatment. They were drawn while in a state of phagocytic activity and show malarial pigment.
- (16—20) Histiocytes from cases of malaria 48 hours after the commencement of treatment. They show malarial pigment.
- (21) A monocyte from a case of malaria 48 hours after the commencement of treatment showing malarial pigment.
- (22) Probably a slightly-stimulated monocyte on account of its larger size, the shape of its nucleus and the greater amount of ingested material.
- (23) A large histiocyte from the spleen of a case of kala-azar showing in its cytoplasm a red blood corpuscle and several large neutral-red vacuoles. This type of cell has actually been seen ingesting a variety of materials present in its environment.
- (24) A small histiocyte from the spleen of a case of kala-azar.
- (25) A monocyte from the spleen. The rosette is invariably beautifully formed.
- (26) Probably a stimulated monocyte. It shows a rosette of irregular shape.

PLATE.



hæmoglobinuria; by Leede (1911), Schilling (1919), Hess (1922) and Seyderhelm (1923) in endocarditis; and by Kartschown (1925) in recurrent fever. As for finding the cells in experimental animals, they have been reported by Evans and Winternitz (1911) in rabbits after repeated injections of trypan blue; by Aschoff and Kiyono (1913) and Kiyono (1913-14) in rabbits after repeated intravenous injections of lithium carmine, isamin blue, collogol and others; by Simpson (1922) in rabbits after repeated injections of colloidal dyes, Indian ink and various other substances, and by Cash and Hu (1927) in hamsters after experimental infection with *L. donovani*.

As regards the relationship between the histiocytes of the blood and tissues, it is generally believed that the former represent the smaller forms of the latter that have escaped into the peripheral circulation. Although normally the tissue histiocytes are considered sessile and incapable of wandering away from their site, under the influence of certain pathological, pharmacological or other stimuli, they seem to acquire a tendency to free themselves and wander into other tissues. The larger forms that find their way into the circulating blood on account of their size are caught up in the fine lung capillaries and those that are of smaller size get into the peripheral blood.

Regarding the precise relationship between monocytes and histiocytes no final conclusions can yet be drawn. There is still some dispute regarding their origin being common, the capacity of one cell-type to become transformed into the other, and their functional unity. From our limited observations we are not in a position to favour one or the other view regarding their origin; but, as already pointed out, we have found all gradations between the typical monocyte and the typical histiocyte in several of our supra-vital preparations, and this leads us to believe that the monocytes do possess the capacity to transform themselves into histiocytes under functional stress. As to whether the reverse ever takes place we have no evidence one way or the other. Regarding their function, as we have seen monocytes and histiocytes taking up and destroying the asexual forms of the malarial parasites, there is no doubt that both types are phagocytic. But we have also found that their capacity to engulf differs both in degree and with the nature and form of the parasite. From this we are inclined to think that after phagocytosis the events taking place in the two types of cell may be different and therefore from the standpoint of various infecting agents the function of the two cell types is likely to be slightly different also. This however does not prevent us from recognising that their immunological functions may be both supplementary and complementary.

Morphologically, blood histiocytes are the largest of the blood cells, being larger than the largest monocyte which they may resemble closely. They are relatively more phagocytic (*sensu restricto*) than monocytes and the pseudopodia they throw out generally present a stump-like appearance. The nucleus is very variable in shape and differs from that of the monocyte by being small in comparison to the size of the cell, by often being oval rather than kidney-shaped, and by occupying either a central or an eccentric position. The protoplasm is somewhat granular and shows phagocytosed substances such as neutral-red. Blue-staining mitochondria are also present in the cytoplasm, but their number appears to be very variable. We have seen cells showing no mitochondria, as well as those showing thirty or more of these. The chief characteristic by which the cell is identified is its reaction to neutral-red. From the larger number, the bigger size, the deeper colour, and the irregular distribution of the dye particles, one can in the majority of instances readily distinguish it from the monocyte; but as already pointed out when intermediate forms between the typical monocyte and the typical histiocyte are present in the blood then the question of classification becomes a difficult matter.

The morphology of the tissue histiocyte, as seen in spleen or liver puncture material, is distinct from that of the blood histiocyte. The former contains a greater variety of phagocytosed substances than the latter, and one can see in their cytoplasm red blood cells, cell nuclei, debris, platelets, etc., in addition to neutral-red. They are more voracious phagocytes and it is not at all uncommon to see many of them packed full of ingested substances. Also the neutral-red vacuoles contained in them are of a very much larger size being as big as red blood corpuscles. Blue staining mitochondria are generally completely absent especially in the larger forms.

The differential characteristics of the lymphocyte, monocyte and histiocyte are given below in the form of a table.

Myelocytes

These are referred to here only because they have often been mistaken for histiocytes. We have seen them in our studies of abnormal blood, in kala-azar, malaria, leukæmia and other cases. They are fairly large, round, non-motile cells, with an oval or indented, eccentrically-placed nucleus and a cytoplasm showing faintly-staining, fine, uniform granules, somewhat similar to those of the neutrophils. The appearance of the cell as a whole including the nucleus is quite characteristic and once seen can never be mistaken again for any other cell.

A comparison of the characteristics of the mononuclear leucocytes in supra-vital preparations of peripheral blood

Characteristics	Lymphocytes	Monocytes	Histiocytes
Morphology and motility ..	Round. No pseudopodia or movement.	Round. Pseudopodia when present blunt; movement rare.	Irregularly round. Many bleb-like or one long finger-like pseudopodium; movement slight.
Size	Small forms about 8 μ . Large forms up to 12 μ or 14 μ , rarely above 14 μ .	Generally about 14 to 16 μ in healthy blood. Abnormal forms may be larger or slightly smaller.	Invariably over 20 or 25 μ —large forms of 30 μ and over may occasionally be seen.
Nucleus	Slightly irregular. Kidney shaped or round. Position usually eccentric sometimes central.	Distinctly kidney- or horse-shoe shaped. Eccentric.	Oval or indented. Eccentric.
Cytoplasm	Unstained. Slight in amount. Appearance glassy clear. Mitochondria blue and many. Neutral-red granules when present of orange colour; in normal blood 0 to 5 in number. Size fine irregular in distribution; when abnormal simulate monocyte.	Unstained. Moderate. Ground glass. Blue and many. Neutral-red granules always present and of orange colour; 20 to 30 in number, fine and uniform in size, forms a rosette opposite the hof of the nucleus.	Unstained. Plenty. Finely granular. Blue, a few or none. Neutral-red vacuoles always present and of orange colour. Numerous, large, and widely distributed.

Differential leucocyte count

The relative proportions of the different leucocytes in the different animal species studied by the supra-vital staining technique

(3) A table of the relative proportions of the different leucocytes in man and in four laboratory animals, monkeys, rabbits, mice and hamsters, is given.

TABLE

Leucocytes	Man	Monkey	Rabbit	Mice	Hamster
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Polymorphonuclears ..	65 to 68	35 to 40	45 to 50	35 to 40	20 to 25
Monocytes	4 to 6	4 to 5	6 to 8	3 to 5	1 to 2
Histiocytes	0 to 0.5	....	....	....	0 to 0.5
Lymphocytes	24 to 26	55 to 60	35 to 40	50 to 55	65 to 70
Eosinophiles	2 to 4	2 to 3	4 to 6	1 to 2	2 to 3
TOTAL W. B. C. ..	6,000 to 7,000	15,000 to 25,000	7,000 to 9,000	12,000 to 14,000	8,000 to 10,000
Number of examinations ..	18	16	20	20	10
Number of animals examined	6	6	7	6	5

are given in the following table. The figures represent the approximate average percentage for normal healthy animals.

Summary

- (1) A description of leucocytes as seen in supra-vital preparations of blood of man and laboratory animals in their healthy as well as diseased states is given.
- (2) The differential characteristics of the mononuclear leucocytes are tabulated.

(4) Camera lucida drawings of leucocytes stained supra-vitaly by a mixture of neutral red and Janus green are presented.

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CYTOLOGICAL STUDIES OF THE BLOOD AND TISSUES IN KALA-AZAR AND ASSOCIATED CONDITIONS

Part III

LARGE MONONUCLEAR CELLS IN HUMAN MALARIA

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IN a large number of diseased states the cells of the blood reflect directly the pathological processes going on inside the human body, and from a careful study of the character and distribution of these cells important data of diagnostic value can readily be obtained. It is also true that, even when one is dealing with a new and hitherto unrecognised disease, a knowledge of the cellular changes of the blood will afford information regarding the probable nature of the ætiological agent. Thus, while the diagnostic and ætiological importance of cytological studies is generally accepted by all, it is only a few that realise that from these

studies data of value to the immunologist may also be obtained. The results of the investigation recorded in this article will show that when a suitable technique, such as, for example, the supra-vital staining method, is used for the study of blood cells in certain select diseased states, such as malaria, important information regarding the nature of the defensive mechanism in that disease may very well be gathered.

Everyone who is acquainted with malaria is aware that the most constant and characteristic change in the blood of patients suffering from the disease, other than the presence of the parasite, is an increase in the number of the large mononuclear leucocytes. That this increase has an important immunological significance is not a new idea, but has been recognised even by the earliest workers. Thus MacCallum in 1898 noticed the large mononuclear cells actually phagocytosing and destroying the parasites of malaria in birds, and from this he attributed to them a definite protective function. Next Thompson in 1912, after the study of a large number of human malaria cases, observed that 'the mononuclear leucocytes, especially the large variety, are undoubtedly the soldiers of defence in malaria', and that administration of quinine resulted in the decrease of parasites and the increase of large mononuclear leucocytes. Gaskell and Miller (1920) in their studies of malignant malaria found that the malarial parasites were phagocytosed by what they described as the 'branched supporting cells' of the spleen and 'stellate cells' of the liver, both of which are now recognised as belonging to the group of large mononuclear cells composing the so-called reticulo-endothelial system. MacLay (1922) noticed that in cultures of *P. falciparum* there is a marked tendency for infected red blood corpuscles to collect round and adhere to the large mononuclear leucocytes, and from this he concluded that these cells play an important part in the destruction of the parasite. Ben Harel (1923) from a study of bird malaria showed that destruction of the parasites was due to the activity of fixed tissue phagocytes. Hughes and Shrivastava (1930) from a study of the mononuclear changes in malaria found that the administration of quinine resulted in an increase in the number of these cells and suggested that they must therefore be responsible for the overcoming of the infection. Taliaferro and Taliaferro (1929) from their studies of the immunity mechanism in bird malaria came to the conclusion that the chief mechanism of defence against malaria is phagocytosis and destruction of the parasites by the large mononuclear leucocytes without the mediation of any antibodies.

Thus, while all the evidence lends support to the view that the large mononuclear leucocytes are the chief protectors of our body from malaria, there appears to be little or no evidence

to show whether the two types of large mononuclears, the monocytes and the histiocytes, are equally responsible for this protection, and, if so, what exactly is their respective functional rôle. Mulligan (1929) who studied the blood changes in acute and chronic malaria by supra-vital staining technique found that histiocytes tended to increase in acute malaria and monocytes in the chronic form of the disease. Other than this there appears to be no other work on this subject. Therefore, we thought that by investigating with the help of the supra-vital staining method the mononuclear changes in malaria patients before and after the administration of quinine and then correlating these results with clinical progress and parasite rates, we might be able to obtain valuable data regarding the functional rôle of monocytes and histiocytes in malarial immunity, and also to determine what are the cytological changes favouring leishmania invasion in malarial subjects, who we have reasons to believe on other grounds (Napier and Krishnan, 1931) are more susceptible than the normal individuals to kala-azar infection. With this object in view we studied in detail altogether

60 samples of peripheral blood from 12 cases of malaria. From each patient 1 to 3 specimens were taken prior to treatment, and 2 or more between the commencement of treatment and the time of disappearance of the parasites. In order to ensure uniformity in results the blood samples were taken from each patient exactly at 24 hours intervals. The large mononuclear phagocytic cells found in these were enumerated and with the help of supra-vital staining classified into monocytes, histiocytes and an intermediate type. The necessity for the creation of an intermediate type arose because of the presence of cells resembling partly the monocytes and partly the histiocytes and of the uncertainty as to whether these cells represented stimulated monocytes or small histiocytes (*vide* Krishnan, Lal and Napier, 1932). The drugs used for treatment were quinine or Erion*, and Plasmochin.

The results are given in tables 1 to 4.

* Erion is a synthetic preparation which has considerable antimalarial properties. Two papers on this compound will appear in the April number of this Gazette.

TABLE I

Showing the percentage distribution of monocytes, histiocytes and intermediate forms in the blood in cases of acute malaria before treatment

Total leucocytes per c.mm.	4,375	3,500	4,500	5,000	6,250	3,750	4,500	3,750	5,000	5,000	6,000	4,500	3,275	4,250	5,000	3,750	4,375	3,750	4,375	5,000	Mean
Monocytes ..	4	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1.8
Intermediate forms ..	2	3	4	4	4	2	2	2	1	3	2	2	1	1	5	4	3	2	1	1	2.5
Histiocytes ..	0	3	2	2	2	6	4	4	3	1	2	2	2	3	3	2	2	2	2	2	2.5
Total large Mononuclears	6	9	8	8	8	10	8	8	6	6	6	6	5	6	9	7	6	5	4	4	6.8

TABLE II

Showing the percentage distribution of monocytes, histiocytes and intermediate forms in the blood in cases of acute malaria after treatment

Total leucocytes per c.mm.	6,875	6,875	5,625	5,000	4,375	6,250	5,625	6,250	5,000	6,500	6,250	5,320	5,000	4,375	3,750	5,000	5,625	6,250	5,000	7,500	5,625	6,250	Mean
Monocytes ..	6	6	6	5	5	5	5	4	4	3	3	3	3	3	3	3	3	2	2	2	2	10	4
Intermediate forms ..	3	2	2	6	5	4	2	5	4	4	4	4	3	3	1	1	1	5	2	0	2	2	2.8
Histiocytes ..	5	2	2	4	7	5	2	7	6	5	3	3	6	4	9	4	3	2	4	5	2	2	4.2
Total large Mononuclears	14	10	10	15	17	14	9	16	14	12	10	10	12	10	13	8	7	9	8	7	6	14	11

TABLE III

Showing the percentage distribution of monocytes, histiocytes and intermediate forms in the blood in cases of malaria of long duration, before treatment

Total leuco-cytes per c.mm.	4,375	6,250	6,875	5,000	4,750	4,375	3,750	3,125	Mean
Monocytes ..	5	4	3	3	2	2	2	2	3
Intermediate forms ..	1	1	2	1	2	0	0	0	1
Histiocytes ..	1	0	0	1	0	2	1	0	0.5
Total large Mononuclears	7	5	5	5	4	4	3	2	4.5

TABLE IV

Showing the percentage distribution of monocytes, histiocytes and intermediate forms in the blood in cases of malaria of long duration, after treatment

Total leuco-cytes per c.mm.	6,000	6,250	5,625	6,250	7,500	6,000	6,250	5,625	5,000	4,375	Mean
Monocytes ..	4	3	2	2	2	2	2	2	2	1	2.2
Intermediate forms ..	1	2	3	4	4	2	3	2	1	1	2.3
Histiocytes ..	1	3	3	1	0	2	0	1	0	5	1.6
Total large Mononuclears	6	8	8	7	6	6	5	5	3	7	6.1

From table I it will be seen that the total large mononuclear count in acute malaria ranged between 4 and 10 per cent. and that the average was about 7 per cent. The monocytes were less than 2 per cent., intermediate forms and histiocytes about 2.5 per cent., each.

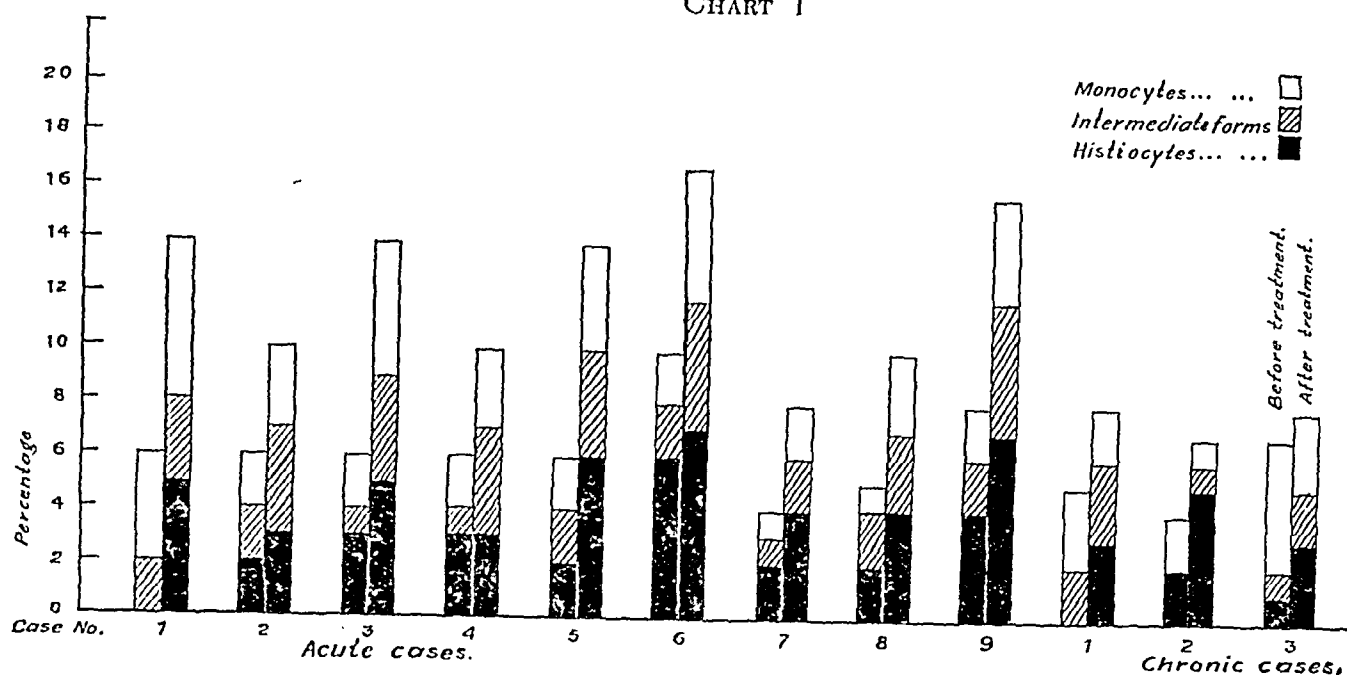
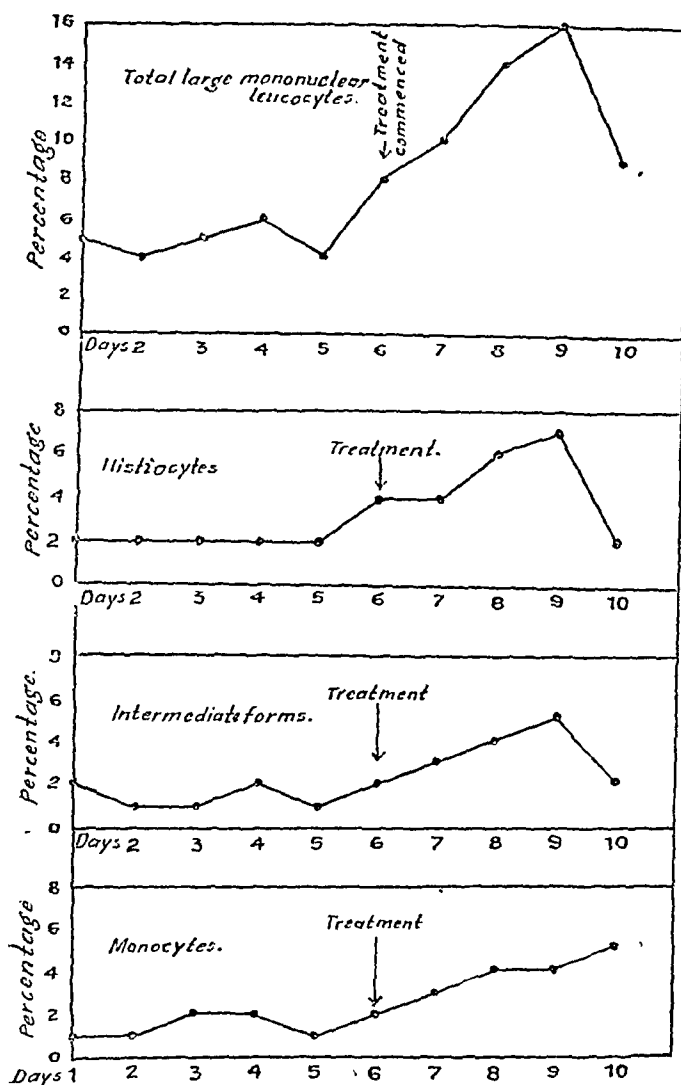
From table II it will be evident that after the administration of specific drugs in acute cases the large mononuclear count showed a marked rise—its range then being from 6 to 17 per cent. with an average of 11 per cent., both monocytes and histiocytes contributing equally towards this increase.

From table III it will be seen that in chronic cases of malaria the large mononuclear counts were comparatively low, being only about 2 to 7 per cent. with an average of 4.5 per cent., and were composed chiefly of monocytes, with a few intermediate forms and even fewer histiocytes.

Table 4 shows that in chronic cases treatment does not bring about as good and rapid a response as in acute cases. The average total large mononuclear count in the cases studied was only about 6 per cent. to which all the three forms contributed approximately an equal share.

While taking the blood at a fixed time each day a careful record of the patient's temperature was also made; it was noticed that during the height of the pyrexia in acute malaria the large mononuclear count was invariably low and during the apyrexial interval it was very much higher, also that after the administration of quinine the highest large mononuclear count was reached generally within 48 hours and that with the disappearance of the parasites it dropped to normal. In chronic cases it was observed that the counts did not vary quite so much with the temperature as in acute cases, and that after the commencement of treatment the highest large mononuclear response was not reached until 4 or more days had elapsed, and that even then the rise was never quite as pronounced as in the acute cases. Therefore, in chart 1 we have shown the highest mononuclear count obtained both before and after treatment for each case, the fallacies, which might arise through the variations in the counts in the same individual to which we have referred above are thus to a large extent eliminated. In chart 2 the large mononuclear changes observed from day to day in one typical case of acute malaria are represented graphically.

CHART 1

CHART 2
CHART 2.

It will be evident from the charts that the administration of quinine results in a significant increase in the total large mononuclear leucocytes both in acute and chronic cases alike,

and also that monocytes and histiocytes contribute equally towards this increase. It seems, therefore, reasonable to opine that both cell types play important parts in overcoming the infection, but the exact functional rôle of each of these cell types is being further investigated. From this preliminary study it is not possible to draw any definite conclusions, yet we think that we should record the following views based purely on the observations made during this investigation. The phagocytic capacity of the different types of mononuclears varies only in degree, histiocytes being the most phagocytic and monocytes the least. We have found malarial pigment and debris more often in histiocytes and the intermediate forms than in monocytes (*vide* plate I). Marked increase of histiocytes (*i.e.*, a histiocyte shower) is invariably followed by disappearance of parasites for varying periods of time, but does not mean always that the infection has been completely overcome. Marked increase of monocytes on the other hand is generally associated either with a persistent though low parasite rate, consisting mostly of rings and sexual forms, or with a latent infection. A marked decrease in these cells is often an indication of an impending rise in the number of parasites. From these pieces of evidence one wonders whether the monocytes have in addition to their phagocytic and destructive powers, any capacity to retard the growth and multiplication of the malarial parasites or to provide the stimulus for the development of sexual forms. We have always noticed that complete sterilization of the patient is obtained only when there is a significant increase in both monocytes and histiocytes. This leads us to infer that the histiocytes, although highly phagocytic, need the help and mediation of the monocytes and the intermediate forms (which we think are

stimulated monocytes), in order completely to overcome the malarial infection.

Summary

(1) The large mononuclear leucocytes in 60 specimens of blood from 12 cases of human malaria have been classified into monocytes, histiocytes, and an intermediate type, with the help of supra-vital staining.

(2) The cytological reaction to the administration of anti-malarial drugs has been observed in these patients.

(3) One of the beneficial functions of these drugs appears to be due to their capacity to stimulate the normal processes of cellular immunity—namely mobilization, proliferation and functional activation of the phagocytic large mononuclear cells composing the reticulo-endothelial system.

(4) In the process of cure both monocytes and histiocytes seem to play equally important parts, their functions being supplementary and complementary.

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ISOHÆMAGGLUTINATION

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IF human red corpuscles are brought into contact with a suitable blood serum they may show the phenomenon of agglutination. The serum contains the agglutinins; the red cells

contain the agglutinogens; union between the two produces agglutination. An attempt was made to discover what portion of the blood serum contains the agglutinins. Blood plasma when matched with suitable red corpuscles was found to agglutinate. Blood serum, of course, agglutinates. Now serum is plasma *minus* the fibrinogen and some calcium salts. So evidently fibrinogen has no influence on agglutination. A few cubic centimetres of serum were brought just to the boil and filtered. The filtrate, which contained all the other constituents of the serum except the proteins, was matched with suitable red cells, which did not agglutinate. The non-protein portion of the blood serum then has, apparently, no action. Serum proteins consist of serum albumin and serum globulin. A few cubic centimetres of serum were half saturated with ammonium sulphate. The globulins were precipitated and the suspension was filtered. The filtrate, which contained the serum albumin, when matched with suitable red cells did not agglutinate. The globulins were then collected from the filter paper and dissolved in a minimal amount of normal saline or distilled water. Sufficient of the ammonium sulphate remains with the precipitated globulins, to enable the latter to go into solution in distilled water. This globulin solution, when matched with suitable red cells, agglutinated the corpuscles. Apparently, the hæmagglutinins are associated with the globulins of the blood serum.

First confirmation.—An albuminous, slightly hæmorrhagic, ascitic fluid was collected from a case of tuberculous peritonitis whose blood belonged to group IV (Moss's notation). This fluid, when matched directly with suitable red cells, behaved like a group IV serum. The globulins from this fluid were precipitated by saturation with magnesium sulphate. The filtrate had no agglutinating power. The globulins were collected, washed, dried in the sun and dissolved in a minimal amount of distilled water. There was a sufficiency of magnesium sulphate with the globulins for the distilled water to dissolve them, as well as to prevent the laking of the red cell suspension, when mixed with the solution. The globulin solution agglutinated like a strong group IV serum. To exclude the influence of the magnesium sulphate present, a few cubic centimetres of the globulin solution were just brought to the boil and filtered. The filtrate, which contained the same percentage of magnesium sulphate as the globulin solution, when matched with suitable red cells, failed to agglutinate the latter.

Second confirmation.—A thin synovial pus was obtained from a patient, belonging to group III. Under the microscope, the cells in this fluid consisted chiefly of leucocytes, with a few red cells apparently due to trauma of needle puncture. The suspended particles in this fluid were got rid of by filtering through

muslin. Undiluted, this fluid agglutinated group II red corpuscles. The globulins from this fluid were removed by half saturation with ammonium sulphate, and when collected and dissolved in distilled water behaved exactly like III serum and if anything, with a stronger agglutinating power. The filtrate which consisted of albumin did not agglutinate.

Third confirmation.—A patient belonging to group II was suffering from proteinuria. Some urine was collected. The centrifuged deposit consisted chiefly of granular hyaline and a few epithelial casts, some leucocytes and epithelial cells and no red cells. This urine was matched with III group red cells and gave a very delayed and feeble agglutination. The urine, which was acid, was neutralised with caustic soda solution and the globulins were then precipitated by saturation with magnesium sulphate and the suspension filtered. The filtrate did not agglutinate, but the globulins, which were dissolved in a minimal amount of distilled water, agglutinated like a strong group II serum.

Conclusion.—The agglutinins of the blood serum are associated with the globulins. All body fluids, normal or abnormal, containing serum globulins, contain agglutinins.

THE CALCIUM CONTENT OF THE COMMON DIETARIES IN INDIA

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WITH the growing popularity of calcium therapy in modern medicine, it is imperative that more laboratory investigations should be made with a view to employing calcium on a more scientific basis. Though much work has been done on the subject, our knowledge is very fragmentary regarding this important member of our pharmacopœia. Amongst all the inorganic constituents of plants and animals, calcium occupies an important place. The importance of calcium to the animal is by no means confined to the building up and maintenance of the bony frame work. Calcium is said to be present in every normal cell; though it is possible for a cell to live for some time in the complete absence of calcium, yet the element is necessary for normal function. In children defective assimilation of calcium leads to rickets; in adults there is a continued demand of the soft tissues for calcium; continued absence of the element from the food leads to withdrawal of calcium from the bones with their subsequent softening, or osteomalacia, a

disease which is very common among the poorer classes in this province. Various investigations have been undertaken to establish and explain the necessity for calcium and the most interesting fact that has come to light is 'ion-antagonism'. Stewart and Percival state that an isolated frog's heart survived much longer and worked more efficiently reaching nearly normal when the perfusing fluid contained Na, K, Ca, than when each of these elements was used separately. Meltzer and Auer observed that the toxic effects of large doses of magnesium salts can be removed by injections of calcium salts. Loeb suggests that calcium is not directly essential for life but that various ions neutralise each other's toxic effect. This toxicity is explained by the experiments of Loeb and Osterhout to be connected in some way with an increased permeability of the cell walls. Stewart and Percival state that for maximal performance of vital activities a correct balance of the various inorganic ions, as well as a correct osmotic pressure, are essential and calcium is a factor in maintaining this balance.

Albu and Neuberg state that the adult man requires approximately 0.4 gm. of Ca per day, but taking into account the great difficulties of absorption 1.0 to 1.5 grms. has been calculated to be the average daily dietary requirement for an adult.

To keep up an adequate supply in the diet it is necessary to know the calcium content of various food articles. Further, it is necessary for the clinician to be furnished with this knowledge so that he may carry it into his daily practice. He can then employ food calcium alone or supplement it with drugs containing calcium, when such therapy is indicated. It has been definitely proved that calcium is better absorbed in the presence of chlorides than when administered alone, owing to the fact that with chlorides there is a more efficient secretion of hydrochloric acid. It may be possible to establish in future that calcium is better metabolised from a dietary rich in calcium occurring in natural organic compounds than from synthetized drugs.

With this object in view and as this work has not been hitherto undertaken in this country, the present investigation was conducted. Though the list is by no means complete, it includes certain substances that are found in the market for the greater part of the year and some throughout the year.

Technique.—A known quantity of the substance is taken in a weighed platinum crucible and calcined to constant weight. The ash is then dissolved in a few drops of concentrated hydrochloric acid. The solution is then neutralised approximately to pH 4. A half volume of 4 per cent. ammonium oxalate solution is then added slowly, drop by drop to prevent the precipitation of magnesium oxalate. After the

addition of ammonium oxalate, the pH of the solution tends to rise, so the reaction is again adjusted to pH 4 and the solution is left overnight to complete the precipitation of calcium oxalate. After the precipitation is complete, it is filtered through a Whatman filter paper (no. 40) and the residue on the filter paper is then washed thrice with re-distilled water to wash off all traces of Na, K, Mg. The residue together with the filter paper is then calcined in a weighed crucible to constant weight. The original weight of the crucible and the weight of the filter paper subtracted from the total weight gives the weight of CaO present in the known quantity of the substance. From this, the amount of Ca present in 100 grammes of the substance is calculated.

The results, expressed as mgs. of Ca in 100 grms. of the substance, are as under:—

Name of substance	1st	2nd	3rd	4th	5th	6th	Average	Remarks
Rice (milled) ..	18.2	22	22	20	24	25	20.1	
Rice (husked) ..	74	72	68	71	55	58	66	
Atta, whole wheat ..	24	26	24	22	24	24	24	
Maida-flour ..	24	18	20	15	18	14	18	
Chana dal (gram) ..	72	70	70	68	70	70	70	
Masoor dal ..	72.8	72.8	18	19	22	18	22.1	
Moong dal ..	50	50	52	48	50	50	50	
Rahar dal ..	27	28	29	47	34	30	32.5	
Brinjal ..	7.5	3.5	7.1	6.4	8.5	7.8	6.8	
Potato ..	7	7	7.8	8.5	6.4	×	7.3	
Lady's finger (vendi) ..	134	134	129	114	116	125	125	
Pumpkin ..	48	49	47	48	50	48	48.3	
Palwal ..	50	42	55	50	50	×	49.4	
Milk ..	150	141	141	138	144	141	142.5	in 100 c.cm.
Mutton* ..	109.2	103.8	108	105	118.8	96	100.6*	of milk.

* By Corley and Denis method.

From the table given below it will be seen that husked rice (unpolished), chana (dal), milk, vendi (lady's finger), pumpkin, palwal and mutton, contain a maximum amount of calcium in the ordinary dietary of Indians.

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A Mirror of Hospital Practice

DIPHTHERIA IN A SURGICAL WOUND

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Mrs. M., aged 23 years, healthy-looking female, pregnant 5 months, was operated on by us during September, 1931, for tuberculous caries of the left rib. Six inches of this rib were removed from its chondro-costal junction backwards: the entire macroscopically diseased area with a clear two inches of apparently-healthy bone as well was removed. The wound healed by first intention. Six weeks later a cold abscess developed under the posterior extremity of the scar which burst spontaneously. A second operation was not agreed to. Dressings with iodoform emulsion were continued and the opening of the sinus was covered with ordinary dressings. For some time the patient was lost sight of. Later, on enquiry, it was elicited that the husband used to procure sterilised dressings and cover the wound himself.

About the first week of December, 1931, the patient was brought to me lying on a stretcher in a helpless condition. The cause was found to be an acute complication around the opening of the sinus

in the form of acute dermatitis. The skin around for about a radius of 2½ inches was swollen and hyperæmic with erosions and vesicles with sodden cuticle over them (not unlike ordinary secondary eczema that occurs in and around neglected wounds). Some of these patches of sodden cuticle suggested membrane formation in patches.

There were painful and enlarged glands in the left groin (oblique set) and in the left axilla. The temperature ranged from 100°F. to 101°F., but the most marked clinical features were great exhaustion, out of all proportion to the local disease, and the extreme distress with intolerable burning and itching pain necessitating morphia. Next day we had a bit of membrane removed for examination at the Medical College laboratory. The patient was living in the city and refused to be taken to the hospital on any account.

The report from the laboratory was negative in the first instance, but the report after 24 hours culture was definitely positive for Klebs-Löffler's bacilli.

Prompt treatment with antitoxin and local antiseptic dressings brought rapid relief to the patient, and up to date no untoward symptoms have been reported to me by the doctor in attendance. There were no children in the family. No case of clinical diphtheria in the immediate neighbourhood has been reported for some time past. The doctors who were attending the family were not treating any case of frank diphtheria.

Remarks

1. Surgical diphtheria of a wound only very occasionally occurs. It is the writer's first case showing this condition.

2. The clinical features of special interest were the painful enlargement of axillary and groin glands on the diseased side, and the marked general depression. The urine, examined once only, showed no albumin, though even its presence in a pregnant female might not have been of much diagnostic import.

3. The rapid improvement of the case shows that surgical diphtheria in an adult is not attended by serious consequences, and hence may be passed over undiagnosed.

4. Diphtheria in a surgical wound may spread, as in this case, from the wound to the surrounding skin.

A CASE OF VOLVULUS OF THE WHOLE OF THE SMALL INTESTINES

By A. K. DUTT GUPTA, M.B., D.T.M.

Assistant Surgeon, Medical College Hospitals, Calcutta

Volvulus of a loop of small intestine is quite common, but only a few cases are on record of volvulus of the whole of the small intestine, with rotation and torsion of the mesentery. The condition is very difficult to recognise even during operation.

The patient, a Hindu male, aged 70 years was admitted as a case of 'acute abdomen' with signs of peritonitis and a feeble pulse. About 24 hours before, he had felt a sudden and severe pain in the abdomen, after which he did not pass any flatus or faeces. There was no history of a previous attack.

On operation, a small loop of the transverse colon was found herniated in one of the duodenal fossæ. This was relieved. The whole of small intestine which was black and gangrenous in many places was found completely twisted over the mesentery. This was rotated over itself and the torsion released, but the gut did not show any change of colour. The abdomen was closed. The patient died within a few hours.

I am grateful to the Resident Physician, Medical College Hospital, Calcutta, for kind permission to publish the case.

NOTES ON A CASE OF GONORRHOEAL ARTHRITIS TREATED BY INJECTION OF MILK

By NABADWIP CHANDRA DUTTA

Burmacherra Tea Estate, Kajuricherra, South Sylhet

HAVING read the reports of success in treatment of gonorrhœal arthritis by non-specific proteins, I decided to give this form of treatment a trial; the following are notes of a case successfully treated.

A Hindu male was admitted with pain and swelling of right knee and ankle; he gave a history of chronic gonorrhœa. His temperature and pulse were normal.

Hot fomentations were applied to the affected joints, and he was given by mouth three times daily the following mixture:—

R Sodium salicylate ..	..	gr. x
Potassium acetate ..	..	gr. vii
Potassium nitrate ..	..	gr. x
Potassium bicarbonate ..	..	gr. x
Tincture of hyoseyamus ..	..	min. xx
Tincture of digitalis ..	..	min. vii
Aquam camphoriæ ..	..	ad. oz. i

Next day the left knee, the left ankle, the wrists, and elbows were painful. Scott's dressing was applied to the joints and the medicine continued.

After four days the symptoms were no less, and, surgical treatment being refused and the history of gonorrhœa clear, I decided to give milk injections. I also gave thrice daily the following mixture:—

R Sodium salicylate ..	..	gr. xv
Balsam copaibæ ..	..	min. iii
Liquor potassæ ..	..	min. viii
Spiritus ætheris nitrosi ..	..	min. xv
Potassium acetate ..	..	gr. x
Hexamine ..	..	gr. v
Tincture of hyoseyamus ..	..	min. xxv
Tincture of buchu ..	..	min. x.
Water ..	..	ad. oz. i

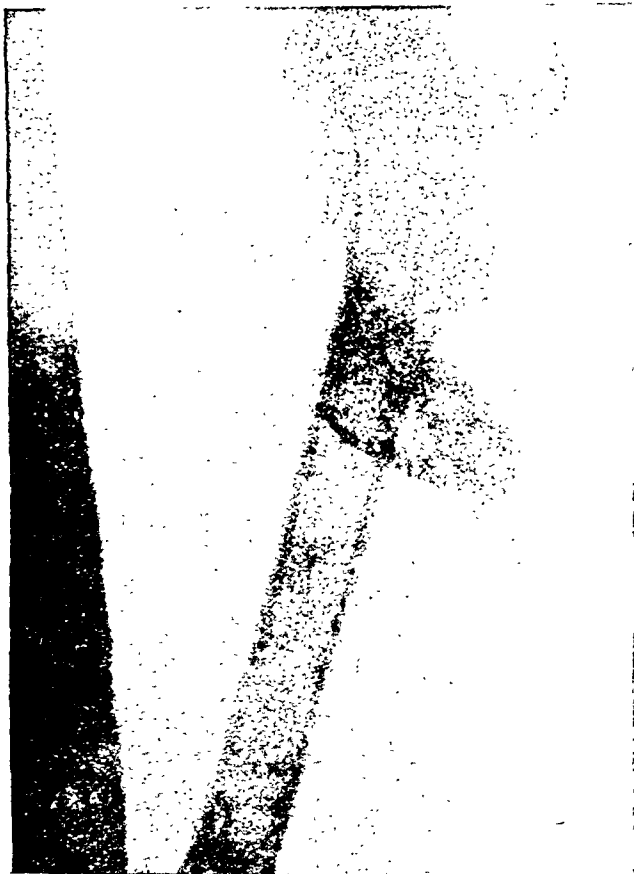
Ordinary milk from a healthy cow was boiled in a test-tube, and when cold injected into the gluteal muscle. The initial dose was 1 c.cm. and this led to a rise of temperature up to 99°F. The second injection was 2 c.cm. and gave a rise of temperature up to 98.8°F. Three days later 5 c.cm. was injected and the temperature rose to 102°F. The fourth injection a week later was again 5 c.cm. and the reaction was a temperature of 100°F. The 5th, 6th and 7th injections were 10 c.cm. at weekly intervals, and each time the temperature rose to 100°F. From the 2nd injection the symptoms abated, and after seven the joints had returned to normal, and the patient was discharged.

A CASE OF MULTIPLE UNILATERAL EXOSTOSES

By A. K. DUTT GUPTA, M.B., D.T.M.

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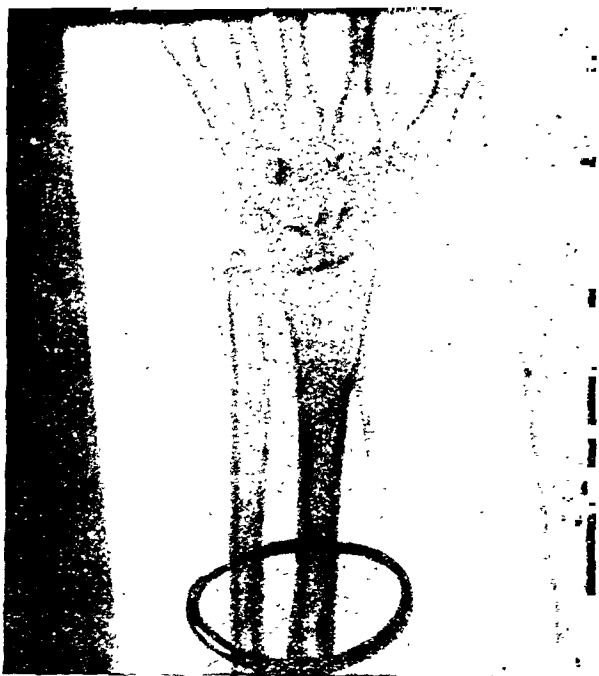
MULTIPLE cartilage-tipped osteomata are often congenital, hereditary, and fairly symmetrically bilateral. They occur near the growing ends of long bones in the vicinity of the epiphyseal cartilage; this gives strong support to the view that they arise in a sequestered part, or 'rest', of the epiphyseal cartilage. They may therefore be common in cases where present or previous rickets have caused irregular growth of the epiphyseal cartilage. Choyce refers to a boy aged 4 years who had 217 osteomata



Cauliflower-like exostosis, lower end of femur.



Fused exostosis of the upper ends of the tibia and fibula.



Spike-like exostosis of lower ends of radius and ulna.



Exostosis of a metatarsal bone.

involving most of his long bones, several ribs, the clavicles, etc. The boy's father also had several osteomata.

The following case is of interest being one of multiple one-sided exostoses of the long bones, which is a very rare condition.

The patient, a Hindu female, 30 years, was admitted for fracture of the right patella. In the course of systematic examination she was found to have large exostoses of many of her long bones, *e.g.*, the lower end of the femur, the upper ends of the tibia and fibula, one metatarsal bone, the humerus, the lower end of the radius, and one metacarpal bone, all on the left side of the body; on the right there were none. She said they had been present from her childhood, and were causing no trouble. There was no history or signs of rickets, or a family incidence of the condition.

I am grateful to Major S. N. Mukerjee, I.M.S., Second Surgeon, Medical College Hospitals, Calcutta, for kind permission to publish this case.

Special Articles

OBSTETRICS IN THE TROPICS POST-GRADUATE LECTURE NOTES

By V. B. GREEN-ARMYTAGE, M.D.
F.R.C.P. (Lond.), F.C.O.G.
LIEUTENANT-COLONEL, I.M.S.

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Obstetric shock

You will not be long in general practice before you will see a case of this condition—a condition which will cause you great anxiety. You may meet with two different types. The first is the early or primary type which follows immediately after the birth of the baby, and is due to reflex dilatation of the capillaries of the skeletal muscles with the result that the blood is dammed up and lost to the general circulation, the patient lying apathetic, grey and cold with an almost imperceptible pulse due to the fall in blood pressure. The other type is spoken of as delayed or secondary shock, and experience in this hospital leads me to think that this type is by far the most common, for, as you know, often-times patients are brought here after hours in labour at their houses. In this class of case the shock is caused by some poisonous substance, probably histamine, which is absorbed from damaged tissues and causes widespread relaxation of the skeletal capillaries and constriction of the pulmonary arteries and hepatic veins.

Miles Phillips states that this 'toxic substance' increases the permeability of the capillary walls and so produces a reduction of blood volume

by the escape of plasma into the tissues, thus diminishing the amount of blood plasma circulating to the upper parts of the body and, particularly, the brain, which is the essential feature in the modern conception of shock'.

That absorption of toxic substances from damaged tissue is the cause of secondary shock, there can be little doubt, and those of you who have seen war wounds or communal riot injuries will bear this out, for you must have attended many patients suffering from ugly, but not lethal, wounds who have succumbed within a few hours to secondary shock.

Similarly, if the pelvic floor, vagina and perineum are severely lacerated in a difficult obstetric operation after prolonged labour it is no uncommon occurrence for the patient, within a few hours, to develop all the signs and symptoms of profound collapse.

This being so it is all-important from the point of view of prevention that you should bear in mind such predisposing causes as:—

- (1) Hæmorrhage.
- (2) Prolonged muscular exertion.
- (3) Prolonged chloroform anæsthesia.
- (4) Prolonged deprivation of fluids and carbohydrates.
- (5) Sepsis.
- (6) The fact that in the tropics mild or severe toxæmia of pregnancy associated with avitaminosis is very common.
- (7) Exposure and fright.

I cannot at this juncture go again into the whole detail of antenatal care for it would take too much time, but I do want you to realize that I am considering an emergency condition in a patient whom you may never have seen previously. Therefore should you be called to do an obstetric operation on a patient late in labour, remember that although your operation may be eminently successful, if you do not bear in mind some of these predisposing causes your patient may, within an hour, sink into a condition of profound shock and die.

Consequently if the systolic blood pressure is below 100 mm. unless active hæmorrhage is occurring delay all manipulation, keep your patient warm, and give her hot drinks—particularly hot water or hot milk to which you have added much cane sugar (*tal misri*) or honey, and give her a pint of 20 per cent. glucose into a vein, or one pint of saline into each axilla subcutaneously.

It is equally important to realize the mental and muscular exhaustion of your patient, for I am convinced that this factor is responsible for much maternal mortality, therefore I advise you to follow the long practice of this hospital and inject scopolamine without morphia. We give scopolamine 1/100th of a grain every half

hour for two or three doses while things are being got ready. This drug has no deleterious effect and Professor Phillips has observed 'that the fall in blood pressure after a difficult labour is less after its use'.

Unfortunately we are unable to use gas and ether anaesthesia, but in such a case as I have been describing a combination of Pernoctan and ether has proved useful.

Hæmorrhage in every case should be prevented, whether it be by pituitrin, manual removal of the placenta, compression of the uterus and aorta, or hot douche, but let me remind you of what I said last year, namely, that if the placenta is retained, the uterus is hard, and there is no bleeding, do not in any case of obstetric shock attempt to remove the placenta until such time as the patient has recovered, waiting even 24 hours in a desperate case.

Moreover, should there be severe tearing of the perineum and muscles of the pelvic floor, do not under any circumstances attempt such suturing as can very easily and with benefit be left until the following day.

Finally remember that when the immediate dangers have been recovered from, infection may cause great anxiety. Experience during the last three years has convinced me of the importance of Hobb's glycerine treatment and large doses of vitamin A in the form of Radiostoleum, in addition to such routine treatment as fresh air, sunlight, diet, and postural treatment.

Phillips and W. Williams both emphasize the importance of emotion as a predisposing factor in shock.

This aspect of confinements must be borne in mind, for the fright of obstetric operations or the neonatal death of a long-wanted baby may cause a patient in the East to turn her face to the wall and die.

For this reason the amnesia of scopolamine before labour, or morphia after, is very precious.

Induction of labour

At the Obstetric Conference in April 1931 some very interesting papers were read on the induction of labour, and convincing statistics were produced by several authorities of a new method of procedure which consists in rupturing the bag of membranes.

It was shown that there was no case in which labour failed to follow this method and that it was applicable to all cases considered eligible for induction in the last 6 or 8 weeks of pregnancy.

There was no case of failure reported and no sepsis or infantile distress. The minimum time for the completion of labour was 4 hours, the maximum was 72 hours—primigravida responding more quickly than multiparae.

In the Eden Hospital there are always many cases every year demanding induction, so I determined to try out this new method in preference to our usual routine of stomach tube and pituitrin.

The method I have employed is as follows:—

First administer a hypodermic of hyoscine, morphine and atropine, and then with the patient in the lithotomy position, cleanse the vagina and cervix thoroughly with ether soap and brilliant green (1:100 solution). Insert a posterior speculum and grasp the anterior lip of the cervix with a sponge-holding forceps. Then pass an unsheathed Bozeman's catheter or sharpened prostatic catheter through the cervix between the membranes and the uterus, round the presenting part until it is opposite the water-filled space near the neck. Depress the handle of the Bozeman with a slight jerk and it will puncture the membranes. Liquor amnii up to, say, 20 oz. is then drawn off and the patient is sent back to bed.

Another method I have used is first to scratch the membrane in front of the head with the stylette of a catheter and then alternately push up the head of the fœtus and let go. By so doing one can milk out 10 to 15 ounces of liquor amnii.

The advantages of this treatment are

(a) That no anaesthetic is necessary and in multiparae no morphine is necessary.

(b) There is no danger of sepsis as the catheter is removed when sufficient liquor amnii has been withdrawn.

(c) After withdrawal of the liquor amnii, the head of the child descends into the pelvis on to the cervix, stimulating dilatation and reflex contraction of the uterus.

This method is particularly applicable for patients with slight disproportion, and all cases of albuminuria which have not responded to treatment. I have used it so far in 18 cases.

There was only one avoidable catastrophe and that was a case in which by mistake (following the technique of stomach tube insertion) 3 minims of pituitrin were given half hourly to start labour pains. In this case unfortunately the child was born in asphyxia due to intracranial trauma.

Alkalies in the renal complications of pregnancy

Recently I have seen several cases of sudden transient œdema in pregnant patients from the 5th month onwards in whom the urine was practically normal except for a marked decrease in the chlorides.

In one of these, the wife of a distinguished physician, the œdema occurred to an alarming degree, the legs and hands becoming enormously swollen and the face so puffy as to obscure vision.

In another the lips, abdominal wall and feet would suddenly become œdematous; in neither was there any alteration or indiscretion in diet, but in both there was headache and heaviness. In both, during the attack, the chlorides fell to 0.1 per cent.

Recent research work at Queen Mary's Hospital, London, has shown that in cases of normal pregnancy there is a considerable decrease in the plasma bicarbonate, and that this decrease remains constant throughout the period of gestation.

Normally the water content of the blood is increased in pregnancy, and the lower the plasma bicarbonate becomes, the greater the œdema.

I am unable to explain the biochemistry of the reaction, but in these two cases, and several others, the administration of $\frac{1}{4}$ to $\frac{1}{2}$ ounce each of bicarbonate of soda and potassium citrate per day in water for a few days caused total disappearance of the œdema without any change in diet; at the same time the chlorides rapidly rose to 0.5 or 0.6 per cent. in the urine.

This therapeutic test will be of use to you, for cases of œdema, pre-eclamptic or otherwise, are very common in the East and you will find that alkaline treatment promotes diuresis and diminishes the œdema, without the discomfort of sweating, purgation and extreme limitation of diet.

It should be observed also that Clifford White some years ago demonstrated the fact that the administration of large doses of alkalis was of real value in the prognosis and treatment of pregnancy albuminuria and toxæmia.

Pregnancy anæmia

During the last two years much attention has been paid to the subject of pernicious or tropical anæmia of pregnancy—that type of anæmia in which the blood picture shows enlargement of the red cells and the presence of megaloblasts.

This disease, although often complicated by malaria, hookworm disease, or sprue, is a distinct entity characterised by its blood picture and the fact that, unlike secondary anæmia, it is not benefited by iron and arsenic.

Lucy Wills, under the aegis of the Indian Research Fund Association, by numerous experiments on animals and human beings, has demonstrated the fact that this anæmia is not only a vitamine A, but a vitamine B deficiency disease and that Marmite (vitamine B) is as active as liver extract in causing regeneration of the blood cells.

This disease is always with us in Bengal, and I am very pleased to tell you that carrying out her recommendations we have had excellent results with Marmite given in 2 teaspoonful doses twice a day either in cold water or in soup.

Marmite is very cheap and is uniformly more popular with patients than is liver, being of vegetable origin.

In a consecutive series of 50 cases I have no hesitation in stating that the clinical and pathological state of the patient greatly benefited as a result of Marmite treatment.

Again let me impress on you—prevention is better than cure—and that seeing how fatal this disease is (roughly 60 per cent. die) it is imperative for both doctors and public to recognise and treat these cases early.

The distinctive features of the blood picture with progressive anæmia are characteristic, but still I find patients arrive in hospital who have been treated for months as secondary anæmia, or in whom the œdema has been considered to be of renal origin.

The value of direct blood transfusion should never be neglected in these cases when a donor is available.

For instance, Mrs. M. (Hindu) 6-para, Wassermann reaction negative, was admitted in February 1931 in a desperate condition, with hæmoglobin 20 per cent., red cells $1\frac{1}{4}$ million. Sixteen ounces of blood were transfused. Her general condition greatly improved and she was confined at the 37th week and is alive and well to-day.

Mrs. H. (Muslim), Wassermann reaction negative, 9 children all dead, and all born prematurely because of pregnancy anæmia, was admitted at the 7th month in August 1931. Hæmoglobin 25 per cent., red cells $1\frac{1}{2}$ million, œdematous. Seventeen ounces of blood from her husband were transfused. She went to the 28th week and was confined in hospital naturally. Mother and infant left the hospital in good condition.

If direct blood transfusion cannot be arranged for, it is possible to improve your results by diet, sunlight, Marmite and intravenous injections of liver extract (Hepatex P. A. F., Lescher and Evans).

Iron and arsenic do not seem to benefit these patients at all—possibly because there is no achlorhydria in true pregnancy anæmia. But I do think that fresh ferrous carbonate in 10-grain doses three times a day is useful in the early stages of the disease, or in cases intolerant of liver, for clinical observation makes me think that the border-line between chronic simple anæmia and pernicious anæmia of pregnancy is not great. If this is so, it would account for the extreme frequency of this disease in Bengal, Bombay and Madras—all malarious, crowded and devitalising areas.

Obstetric prognosis

The more one sees of obstetrics the more difficult it is to be absolutely didactic, for frequently patients with everything normal have difficult labours and those with circumstances against them have easy ones.

For this reason I am inclined to think that unnecessary emphasis is put upon pelvic measurements. Twenty years at this hospital have convinced me that there are only two measurements of real value; one the external conjugate, the other, the transverse diameter of the outlet immediately in front of the anus.

What you have to concentrate upon is:—

- (1) The relation of the foetal head to the pelvis;
- (2) Whether it is flexed or extended;
- (3) Whether it can descend below the horizon of the brim without overlapping;
- (4) Whether the lie of the child is anterior or posterior.

The pelvic grip, Pawlik's grip, and placing the flat of 3 fingers upon the symphysis will give you this information.

If a vaginal examination is permitted (1) you can try to feel the promontory of the sacrum, (2) you can estimate the size of the sub-pubic angle, and (3) endeavour to compute the degree of possible descent of the head into the pelvis by the Munro-Kerr or FitzGibbons' manoeuvre.

In the tropics, where maturity and marriages are early, small round pelvis and posterior positions are the two most common sources of difficulty.

Therefore you must always be on the *qui vive* as to the degree of disproportion which may necessitate intervention; for experience has taught me that 80 per cent. of tropical obstetric calamities such as eclampsia, septicæmia, complete rupture of the perineum, vesico-vaginal fistula and dead babies are subsequent to long labours in women with posterior positions or small round pelvises.

This being so, whether in hospital or in private practice, we are confronted with the problem of

- (1) induction of premature labour,
- (2) test labour, or
- (3) Cæsarean section in any case where clinical examination suggests disproportion.

Provided the patient has arrived at the 38th week and disproportion is of the slightest, and especially if she is a primipara, I think induction has many claims for it, that is provided the course of labour can be carefully watched, for in that case the labour is to all intents and purposes a test labour, during which surgical intervention is possible, should such circumstances as foetal distress and delayed progress demand it.

Remember that rules and principles in the West are not invariably applicable in the tropics, for due to diet deficiency (particularly vitamin A) and a universal 20 per cent. hæmoglobin deficiency in all our women in the tropics, there is diminished resistance to infection and obstetric shock.

Moreover, uterine inertia is far more common in the East, due to flabby abdominal muscles, and this may jeopardise a seemingly normal case.

For these reasons test labour at full term, or even induction at the 38th week, is fraught with dangers which are hardly considered in the West—dangers resulting frequently in the doctor having the melancholy duty of informing the parents that the baby is dead and the mother very ill.

Every case is a law unto itself; but you must realize what disproportion means and be prepared to face the difficulties, and understand that it is a dreadful thing to perforate the head of a living foetus, when a Cæsarean section would conserve both mother and baby.

In order to confirm these convictions I have reviewed the last hundred Cæsarean sections performed by myself in hospital and in private practice. I find that 65 per cent. were operated upon because the head was lying non-flexed, in a posterior position, and was slightly overlapping the brim; 51 per cent. of these women had been more than 24 hours in labour when Cæsarean section (lower uterine) was performed, and many were post-mature.

Remember, therefore, the old mnemonic:—flexion means descent, descent means rotation, rotation means easy labour: non-flexion means non-descent, non-descent means non-rotation, non-rotation means difficult labour. Only constant palpation of the full-term pregnant uterus in a hospital can give the post-graduate any sense of security as regards prognosis and the best treatment.

To sum up, in the West for slight disproportion, induction or trial labour, followed or not by Cæsarean section has the blessing of authority; whereas in the tropics induction and test labour have certain known dangers, which Cæsarean section does not possess in capable hands.

It is hoped that the tendency in the tropics among general practitioners to destroy a living child, when a Cæsarean section would save it, will gradually disappear with the growth of obstetric knowledge, for as I demonstrated last year the maternal mortality of craniotomy in India from sepsis and obstetric shock is 30 per cent.—a mortality 20 per cent. greater than that of a lower uterine segment Cæsarean section in this hospital for all the calamitous conditions of pregnancy, brought here, put together.

This perhaps is the place to speak to you of another condition arising out of difficult labour, the condition we speak of as foetal shock, for it is a subject I am particularly anxious you should understand and appreciate.

In days gone by when a baby was born after a long labour with or without forceps, in a state of white asphyxia, it was the custom to

wipe out the mouth and then start vigorous artificial respiration, with the result that the infant rarely survived, though should it perchance make a gasp of indignation that was taken as a signal for still more vehement efforts until it died, or shall we say until it was killed. Now we know that these infants are suffering from foetal shock, which is clinically exactly the same condition as I have described in the mother under the heading of obstetric shock.

What you have to do in these cases is to keep the baby warm or better still in a hot bath, after you have cleaned out the fauces. Do not do artificial respiration, but if you feel you must do something then inject adrenalin into the heart or pituitrin into a muscle and rub the gum with brandy. Recently, however, thanks to the research work of Dame Louise McIlroy we have acquired a new method which in part explains an old one.

Professor McIlroy some years ago described this condition of foetal shock and was the first I think to advocate the means we now use, but last year she gave us all a great lead by inventing a means of stimulating the respiratory centre of the pallid foetus, by the use of a mask connected up with a cylinder containing 5 per cent. carbon dioxide and 95 per cent. oxygen. This apparatus which is quite cheap and handy I am able to show you to-day and I am certain we shall be able to achieve her results, which are based on physiological principles.

I said just now that this new method explained the occasional success of an old one, which of course is that of the attendant blowing down into the lungs of the baby through its mouth, hoping as he thought to start the reflex of respiration, but now we know that any fortuitous result of his efforts was not due to any such reflex, but to the natural carbon dioxide content of his expired air stimulating the respiratory centre of the baby.

Please, however remember, I am not talking of the baby born with intracranial trauma. In these, delivered though they be, with pallid asphyxia, permanent recovery is rare. In a few hours they develop twitchings, rigidity, cyanosis and are unable to take the breast or swallow. In such a case it is not foetal shock, but actual hæmorrhage or damage to the brain that kills. Schulze's method of artificial respiration is a deadly method and has killed or maimed many an infant that otherwise would have survived.

Finally, I should like to say again that the science and art of modern obstetrics will not advance until such time as a proper system of post-graduate teaching is established throughout India, for it is now generally recognized throughout the Western world that the maintenance of health and happiness in the family with the prevention of foetal and maternal mortality is the duty and responsibility of every good government.

SPINAL ANÆSTHESIA*

By J. FLETCHER ROBINSON, B.A., M.D., F.A.C.S.,
F.R.C.S.E.

and

T. SESHACHALAM, L.R.C.P. (Lond.), M.R.C.S. (Eng.)
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Introduction.—Spinal, lumbar or subarachnoid anæsthesia was first suggested by Corning of New York in 1885. It was unexpectedly brought to light and its alleged simplicity of technique soon gave it wide popularity. Fourteen years later, Bier had himself and some of his assistants injected with cocaine solution intrathecally and introduced this method as a definite procedure.

Until 1904, cocaine was the most widely preferred of the agents used to produce spinal anæsthesia. Several accidents such as paralysis of the bladder, rectum, lower extremities, and deaths occurred in the early days of spinal anæsthesia with the use of cocaine, which caused a natural fear of the method upon the part of many who were employing it, or who were interested in its use, so that it fell into disuse as a generally-applied anæsthetic. But it was still employed by a few—Tuffier, Bier, Janesco, Babcock, Labat and others—who used this anæsthetic successfully in thousands of cases.

The appellation 'spinal anæsthesia' leads those unacquainted with the physiology of its application to fear effects upon the cord and vital centres. This does not occur. The vital centres are within the cord and can only be reached through the blood stream. The anæsthetic only enters the spinal fluid and is fixed in 10 minutes in the sympathetic (and also later in the motor) nerves that are bathed by the spinal fluid, after which no further absorption occurs.

The phrenics, which are motor nerves, may be paralysed with cessation of respiration, when artificial respiration will have to be resorted to until the effect in them wears off. We have had this occur in only one case, when artificial respiration was carried out until spontaneous breathing was resumed and the operation for pancreatic cyst was carried out. But this is rare, even when anæsthesia exists to the top of the head, when a mastoid operation or craniotomy could be performed.

Owing to prevalent but unwarranted misconceptions this method failed to receive its merited position in anæsthesia. A better knowledge of chemistry has provided a wider selection of drugs. Modern physiology and chemistry are the pathways to effective, safe and satisfactory anæsthesia. Thus, novocaine and procaine gained pre-eminence over cocaine by reason of their lower toxicity. The older methods of anæsthesia are having to compete

* Read at the Mysore State Annual Medical Conference, 9th March, 1931.

with, and are being modified by, newer procedures, such as the use of ethylene, nitrous oxide, acetylene, intratracheal insufflation, regional nerve block with procaine, and spinal, rectal and intravenous anæsthesia.

Evidently, with drugs that are within the limits of safety, a fool-proof technique, with absolute indications given due consideration, spinal anæsthesia has passed the threshold of doubtful applicability and is about to receive wide recognition, and surgery under spinal anæsthesia will become a routine commonplace.

Jackson, who had, up to that time, used it as a routine in his hospital in over a thousand cases, recently made the following statement:—‘The introduction of spinal anæsthesia into the every-day routine of the hospital marks the greatest development in surgery since the days of Lister, not only from the standpoint of the surgeon, but of the patient as well. I make this statement without fear of revocation, because this is the opinion of those who are using this anæsthetic as a routine in operations below the diaphragm.’

Dickson Wright in a recent address made the statement that it was his personal view that in the spinal fluid lies the future of anæsthesia.

The popularity of this method over other forms of regional anæsthesia is probably due to two factors:—(1) the technique is easy of application from the patient's and from the anæsthetist's standpoints; in most instances the spinal puncture produces little more discomfort than the average hypodermic injection and any one who can perform a spinal puncture can produce spinal anæsthesia. (2) The complete muscular relaxation produced following intradural injection facilitates the work of the surgeon and has a tendency to lessen post-operative complications.

The percentage of instances of successful spinal anæsthesia is less when operations involve the upper part of the abdomen than when they involve the lower portions of the body. This is due to nausea or discomfort or pain produced by traction on the gall-bladder or stomach. It is necessary at times to overcome this discomfort, or nausea, or both, either by preliminary medication, or by combining spinal with some form of inhalation anæsthesia. Spinal anæsthesia combined with general anæsthesia is a type of balanced anæsthesia which has much to recommend it. On the other hand, it is desirable and often necessary that complete muscular relaxation be obtained, especially in operations on the upper part of the abdomen. This can probably best be obtained by increasing the dosage of the injected drug and introducing it at a higher level. Dickson Wright has introduced spinal anæsthetic solutions by puncture of the *cisterna magna*. Janesco's dorsal injection might come back into

use, but there is always the danger of introducing novocaine into the spinal cord, when death would immediately occur.

Physiology.—A very brief explanation of the physiological effects of spinal anæsthesia will throw light on some of the disturbances encountered in its use.

In spinal anæsthesia (which is essentially a conduction root anæsthesia) there is an interruption of impulses passing through the roots. The nerve control of the blood vessels is maintained by two sets of fibres—one being motor or constrictor, and the other inhibitor or dilator. Vasomotor impulses coming from the medullary and spinal centres are intercepted, resulting in a marked relaxation in the abdominal vessels sufficient to hold almost all the blood in the body (hence the relatively bloodless field under spinal anæsthesia). This would cause a tremendous fall in blood pressure, so great perhaps that the brachial pressure could not be recorded.

The brain, however, always demands a normal supply of blood and with such a marked splanchnic vasodilation a sufficient supply to the brain can only be maintained by gravity drainage to the heart through the medium of the Trendelenburg position. If the head is kept elevated the brain suffers from acute anæmia which results in respiratory disturbances, ranging from the classical embarrassment of ‘air hunger’ to the ever-dreaded respiratory failure.

Labat states that ‘with this understanding, the Trendelenburg position is the only remedy. We cannot with impunity delay its use until the anæsthetic drug has been fixed to the nerves at any desirable level of the spine. It is dangerous to abstain from using it in certain cases, even though the anæsthetic is not meant to reach the level of the splanchnic nerves; even though the drop in the blood-pressure is expected to be so slight as to be negligible. As a general rule, the Trendelenburg position should, besides, be maintained for three hours at least after the operation. With the use of the Trendelenburg position immediately following the injection, such symptoms as pallor of the face with cold sweats and respiratory embarrassment have almost completely disappeared from the picture; they are still present when the patient is unnecessarily kept in the recumbent posture and placed in the Trendelenburg position too late. They may also be observed when patients, particularly the aged and arterio-sclerotics, are moved too rapidly from the Trendelenburg to the horizontal position, usually at the end of an operation of short duration, such as a second stage suprapubic prostatectomy’.

It has been stated repeatedly that some patients become pulseless on the operating table, and that the blood pressure is so low in certain instances that no reading can be made.

This is quite true and should cause no worry if the patient's condition is otherwise satisfactory; but it is a danger signal if it is accompanied by pallor of the face with cold sweats, particularly when the patient feels very weak, is slow in answering questions, or becomes unconscious. With the Trendelenburg position it does not matter how great the fall in blood pressure may be. The vital nerve centres will not be inactivated. Koster obtains anaesthesia up to the brain by increasing the dosage and amount of solvent, and yet without cardiac and respiratory paralysis.

Bernstein has shown that everywhere in the central nervous system the motor mechanism is particularly resistant to narcosis. Thus respiratory movements, initiated by purely automatic motor centres, may be maintained, despite the existence of a stage of poisoning by anaesthetics in which conduction in sensory fibres has long since been interrupted. It is this property of selectivity, dependent upon inherent differences in nerve fibre endings and cells, which participate in the explanation of the phenomenon of surgical anaesthesia of even the entire body without respiratory or cardiac paralysis. Such selectivity is more marked in the case of novocaine than stovaine.

Practical applications

In many cases requiring surgical treatment the choice of anaesthesia is a matter of vast importance. The remarkable development of local, regional, paravertebral, splanchnic, etc., forms of anaesthesia is a good indication of the failures of the inhalation method to fulfil the requirements of satisfactory anaesthesia. These requirements are safety, universal applicability, maximum relaxation, blandness in the sense that tissue irritation is not produced, ease of administration, and freedom from shock.

It is believed that spinal anaesthesia fulfils these requirements as no other method does. There are no contra-indications to its use except local infections at the puncture site and cerebellar neoplasms, although a blood pressure under 100 mm. is mentioned by some as contraindicating its use. Blood pressure, however, can be maintained and even raised by the employment of ephedrine or adrenalin.

One of the dangers of spinal anaesthesia lies in the lack of knowledge of the fundamental principles of the method, and consequently inability to prevent disturbances as they arise.

This was illustrated in two of the earlier cases of one of us (J. F. R.). A patient suffering from hæmorrhoids desired an operation to be performed under spinal anaesthesia, considering his heart weak, as he had been operated upon under chloroform in London some years previously for another complaint and nearly died on the table. Using stovaine, and therefore thinking the head should be kept high to prevent effects upon the pons, we placed him

in a semi-upright position. When half way through the operation, he showed signs of collapse. He was a medical man himself and two of his doctor friends were present who carried on artificial respiration while the operation was completed. Still continuing to keep him in the semi-upright position after his return to bed, it was two hours before he recovered sufficiently to relieve our minds.

The second was in a patient with duodenal ulcer. He was kept in the horizontal position and, after opening the abdomen and examining the duodenum and proving the presence of the ulcer, his condition became so alarming that the abdomen was hurriedly closed without performing the anastomosis.

In both these cases the immediate placing of the patients in the exaggerated Trendelenburg posture would have overcome the difficulty.

We now also use ephedrin or adrenalin, injected intramuscularly at the time the spinal injection is given to maintain the blood pressure.

It is interesting to note, in passing, that upon occasions when spinal anaesthesia is employed for adynamic ileus (paralytic bowel) from toxic or infective causes, sometimes the effect of the anaesthesia produces an expulsion of gas and faeces and a flattening of the abdomen and relief of all symptoms even before operation is begun. In one case of *ragi* poisoning we administered spinal anaesthesia, without attempting to open the abdomen, and within two hours the patient had copious evacuations of the bowels and was cured.

Occasionally, the patient has a bowel evacuation on the table during the operation, due to contraction of the bowels (the contracted state of the bowels has been mentioned as one of the delightful features of abdominal surgery under spinal anaesthesia). This is due to the removal of splanchnic control, allowing the vagus full range of function.

Spinal anaesthesia, properly controlled and administered, does away with the shock and intoxication of ether or chloroform, and we approach an abdominal operation now with far less trepidation than formerly when those anaesthetics were employed, knowing that we shall find a marvellously relaxed abdominal wall, collapsed intestines, and that the post-operative course will generally be a smooth and easy one without the dread of a distended abdomen from a parietic bowel. With the absence of emesis and flatulence, the post-operative nursing is reduced at least by half, which has been a god-send under our present, woefully understaffed circumstances. And from the patients' standpoint, a preference is indicated for spinal anaesthesia. We have had several patients who were previously operated upon for abdominal conditions under inhalation anaesthesia who had to undergo subsequent

celiotomies and were given spinal anæsthesia. When they were asked which form they preferred, they unhesitatingly replied that they much preferred the spinal, because of the absence of nausea, vomiting and distension. Of course, there are occasional patients who do not wish to know or hear what is going on. For such, their perceptive faculties can be blunted by a modified 'twilight sleep' or a generous use of sodium barbital. The latter has the advantage of being an antidote to cocaine poisoning.

Advantages and disadvantages

Some of the disadvantages of spinal anæsthesia are:—(1) The anæsthesia may diminish before completion of the operation, when supplementary inhalation anæsthesia must be employed. (2) Nausea and vomiting and a variable drop in blood-pressure may occur, but these are now controllable by the use of ephedrine or adrenalin administered intramuscularly, and the Trendelenburg position. (3) Post-operative headache may be complained of in a few cases, which can largely be avoided by the use of a small-gauge puncture needle (of 28 to 22 gauge) with a 45 degree bevel, or relieved by pyramidon, etc. (4) About 5 per cent. of failures. With increasing experience most of these difficulties are being overcome.

Some of the advantages are—(1) The technique is simple and easy of application. (2) Analgesia occurs within 5 to 15 minutes. (3) The heart is not depressed nor is the normal function of the kidneys interfered with, though occasionally post-operative temporary bladder paresis requires catheterisation. (4) Surgical shock is controlled by the blocking of reflexes. (5) Post-operative vomiting and distension are greatly diminished. (6) The danger of post-operative pulmonary complications is lessened. (7) Complete muscular relaxation with maximum exposure and collapse of the bowels are obtained. (8) A relatively bloodless field, and (9) absence of contra-indications.

Armamentarium

Novocaine, or its equivalent under the various trade names such as Planocaine, Tutocaine, Neocaine, Procaine, etc., is the drug of choice for this anæsthesia. Since for several years we have been accustomed to use apothesine and found it very satisfactory we have continued its use. The dose of novocaine or apothesine, or of the various named preparations of novocaine, is one and a half grains, or ten to twelve centigrammes.

Goetz has injected as much as eighteen grains of novocaine into the spinal fluid without deleterious effect. Manufacturers supply sterile, sealed ampoules, containing the measured dose in a finely-divided powder so that solution is almost immediate, which facilitates the administration. Apothesine comes in measured

tablets of a grain and a quarter. We dissolve a tablet in three or four cubic centimetres of distilled water, and boil the solution down to two cubic centimetres. When this is cooled, it is drawn into the syringe ready for injection when the needle is within the theca. Or an ampoule of tutocaine may be used and the powder dissolved in 2 or 4 or 8 c.cm. of spinal fluid, according to the level of anæsthesia desired.

Special syringes are not necessary, but the Labat or Becton-Dickinson-Luer-Lok types are very helpful, as the needle is held securely to the syringe by a simple locking device. Needles are of flexible, non-rustable steel of 18 to 22 gauge, with a 45 degree bevel point. We do not employ preliminary novocaine injection of the skin or needle track, as it seems an unnecessary refinement.

Technique.—The spinal puncture is made with the patient in the upright position, sitting upon the edge of the operation table, with the legs hanging down or the feet supported upon a stool. Under direction of an assistant standing in front of the patient the head and shoulders are bent forwards and downwards under the left axilla of the assistant, the forearms folded upon the abdomen and pressing the trunk backwards. The vertebral column is thus rounded outwards and backwards, increasing the distance between the spinous processes, and separating the laminae. When the patient is unable to sit up because of weakness or local pathological conditions, he may lie upon his side with the knees drawn up, the hands clasped over the legs and the head bent forwards, producing practically the same extension of the vertebræ as in the sitting posture. Immediately after the injection the patient is placed on his back and the head of the table tilted downwards about 30 degrees. The full or exaggerated Trendelenburg position may be assumed at any time desired. The operation can be proceeded with, as soon as the patient is draped. Vomiting occurs in some cases, especially in upper abdominal surgery when traction is exerted upon the stomach or gall bladder. This passes off shortly. When nausea is complained of, the patient is instructed to take long deep breaths, to increase the oxygen content of the blood and overcome the nausea and vomiting.

We shall not take time to detail the technique of spinal puncture, which must be familiar to all of you. But one or two points we should like to mention as they are important in insuring easy and direct puncture. The position of the patient and the point chosen for the puncture are everything in securing a quick, easy and direct passage for the needle. The needle must enter at a point exactly midway between the spinous processes. The tip of the thumb rested upon the spinous process and the thumb nail depressed from this position will crease

the skin at a point midway between that and the next spinous process, the mark being produced even through the gloved thumb. An eighth or even at times a sixteenth of an inch above or below the exact middle point will very frequently make difficulty in finding the point of entrance in the spinal column. The needle is entered about one centimetre to the right or left of the mid-line, because we so frequently strike a vein in the mid-line, which is a source of inconvenience. Another point which we formerly did not observe, and which we find neglected by some, is that, having entered the needle in the exact mid-point between the spines selected, it should be advanced absolutely horizontally. Prodding about with the needle point raised or lowered makes for frequent failure in entering the theca and causes pain to the patient. Frequently, as the needle enters the skin, the patient contracts the back muscles and straightens the spinal column. After the first pain from the entrance of the needle point through the skin, there is little further pain and the patient is then instructed to resume the position required, and the needle speedily enters the theca.

After the spinal fluid has been reached, as determined by the withdrawal of the stilette, the syringe is attached and the contents injected with a fair degree of force to disseminate the fluid as high as possible along the cord. Further admixture with the spinal fluid is attempted by alternate withdrawal and re-injection of the fluid now in the subdural space.

The usual landmarks are the iliac crests. A horizontal line tangential to the highest points of the crests either crosses the spinous process of the fourth lumbar vertebra or passes between the fourth and fifth lumbar spines. For operations upon the lower extremities and perineum, the injection is made between the third and fourth lumbar vertebra. For operations upon the prostate and bladder by the supra-pubic route, inguinal herniotomy, posterior resection of the rectum, and vaginal hysterectomy, between the second and third lumbar vertebrae; for operations upon the kidney and ureter and upper abdominal operations such as gastro-jejunostomy, gastrectomy, cholecystectomy, and splenectomy, it is necessary to inject between the first and second or the last dorsal and first lumbar vertebrae. Anaesthesia may extend to the nipples or even to the supra-clavicular fossae with the ordinary dosage. We have been obtaining total anaesthesia by the injection of 20 to 30 cubic centimetres of 1 per cent. Planocain (May and Baker's equivalent for novocain) solution injected between the first and the second lumbar vertebrae, according to the method mentioned by Dickson Wright. The amount depends upon age, build, length of spine, etc.

An over-wrought or over-anxious patient may require to have his attention diverted at the

beginning of an operation by being engaged in conversation by an assistant, or even to have a few inhalations with chloroform or ether or aromatic spirit of ammonia, though this is rarely required.

Two or three hours before operation 3 or 4 grains of sodium barbital (Luminol) are given by the mouth, and immediately before the subdural injection 10 minims of adrenalin or $\frac{3}{4}$ grain of ephedrin in 1 cubic centimetre of water are injected intramuscularly to help to maintain blood pressure.

Conclusions.

Spinal anaesthesia, when properly administered, provides the safest anaesthetic from the standpoint of the patient.

For the surgeon, the ease of administration, the relaxed musculature, the collapsed bowels and the easy closure facilitate the operative procedures.

Post-operative care is greatly simplified.

Serious post-operative complications, such as pneumonia, embolism, ileus, gastric dilatation and cardio-vascular changes attendant upon the employment of inhalation anaesthesia are materially reduced.

We have operated under spinal anaesthesia upon about 700 cases during the past two years with about 5 per cent. of failures or partial failures (i.e., cases in which the spinal anaesthetic had to be supplemented, in whole or in part, with inhalation anaesthesia, and these in upper abdominal operations). If after 15 minutes, no anaesthesia whatever has occurred, we do not hesitate to repeat the injection. The range of cases included splenectomies, resections of the stomach for cancer, gastro-jejunostomies, cholecystectomies, resection of the caecum for hypertrophic tuberculosis, nephrectomies, transplantation of ureters, intestinal anastomoses, appendectomies, herniotomies, prostatectomies, ovariectomies, hysterectomies and other pelvic operations, haemorrhoids, open operations for fractures, osteotomies, amputations, disarticulation at the hip for gigantism of the left lower extremity, Kondoleon's operations for elephantiasis, excision of tuberculous lymph nodes of neck and axilla, goitre, etc. Recently we operated under spinal anaesthesia upon a six-months-old baby for intussusception.

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Indian Medical Gazette

MARCH

MORE ABOUT THE POPULATION PROBLEM

THE editorial note on the population problem which was published in the *Indian Medical Gazette* of May 1931 has attracted the attention of the public to a very gratifying degree. The *Statesman* deserves a special word of thanks for the valuable publicity which it gave to the subject, and particularly for the notable expression of opinion elicited by an interview with Sir Jehangir Cowasjee. Those who are interested in the subject are referred to the issues of the *Statesman* (Delhi edition), dated May 21st, 22nd and 26th, 1931. The *Swarajya* of Madras on May 23rd published a very striking note on the subject, and the *Red Cross* of July contained a spirited attack by Lieut.-Col. A. D. Stewart, I.M.S., on the views expressed in the editorial.

Words of praise and agreement are pleasing, but out-spoken criticism is often more valuable; indeed it would have been very useful if the article had called forth a storm of abuse, as nothing stirs up public opinion so thoroughly as a heated controversy.

The worst feature of the situation is that even the educated community failed to realize the extreme urgency of the problem; questions which are really of lesser importance like the framing of a new constitution and the financial troubles monopolize the attention of the public while no notice is taken of the ruthless evolution of a far greater emergency. Some of the criticisms of the article were pertinent and therefore call for a reply. The editor of the *Statesman* thought that he had detected a glaring inconsistency in the article. He says that on the one hand we are urging the necessity for action to control the wastage of human life through preventable disease, and on the other we are quoting the recent census figures to show that India is rapidly progressing towards a state of over-population. That is our whole point; though it is not in our argument, but in the present public health policy, that an inconsistency exists. The hygienist may be improving the present state of India, but he is only storing up trouble for future generations. Should then, we are asked by another critic, all public-health measures be discontinued? Emphatically, no! both from a humanitarian and an economic point of view. In a cholera epidemic, does it compensate for the death of the father of a large family if the wife gives birth to twins on the same day? It is still a deplorable wastage, though the combined incidents will have increased the

population. Compare the economic position of this family before and after these events. Our point is that at present everything is being done to prevent the death of the father and nothing to prevent the birth of the twins; both problems are equally urgent. The whole trend of our argument was that while a frontal attack on preventable disease forms an essential part of the campaign for the betterment of the condition of the people, at the same time this would be doomed to failure if it were not combined with measures directed towards maintaining a balance between population and food supply. This is the position and if it is wrong then let someone show the flaw in the reasoning.

Another distinguished critic accused us of limiting our attention to food supply as the one thing needed to maintain a sound economic condition. This criticism cannot be taken seriously; it is sufficiently obvious that the term 'food supply' was being used in its broadest sense and was intended to include not only articles which can be eaten, but also articles like jute, cotton, steel, and tea, which can be exchanged for food.

Criticism which is none the less welcome because it is strongly adverse comes from Lieut.-Col. Stewart in his very interesting note in the *Red Cross*. (We have reproduced this article *in extenso* elsewhere in this issue). Col. Stewart's position can be summed up under three heads: (1) There is no evidence that the food supply of the people of India is inadequate. (2) Better living and falling death rates automatically bring about lower birth rates, so that there is no need to worry about the population question. (3) To tackle India's problem by focussing attention on birth rates alone is wrong; it is putting the cart before the horse.

The third of these criticisms can be dismissed very briefly: a policy of focussing attention on birth rates *alone* was not advocated. Special stress was laid on the fact that the problem is many-sided and complicated, but it was held very strongly that the excessive birth rate is a most important aspect of the problem and one which has been unduly neglected, both by economists and public-health workers.

It is hardly necessary to discuss the first point at length: everybody who knows the conditions under which the people of India live will agree that the population as a whole is badly nourished. This state of things constitutes a chronic malady of India which is accepted as a normal condition, the disease becomes greatly aggravated when the rains fail, but even when there is no great departure from the average rainfall there are extensive areas in which the people are undersized and of low physical efficiency; in other areas the people also suffer to a large extent from such nutritional defects as keratomalacia, osteomalacia and anæmia of pregnancy.

This unsatisfactory state of affairs can be greatly improved by better methods of agriculture and by discarding wasteful customs, but the question remains whether these reforms, necessary though they are, can ever constitute a radical cure unless they be combined with a restriction of the population. It is only too likely that if we could improve the food supply and eliminate waste the population would very soon increase to such an extent that we should again be faced with the population problem.

Col. Stewart in his second point—that populations within an area of fixed limits are subject to a mathematical law, and that if nothing dramatic happens to maintain a high death rate then the birth rate will also fall, 'as night follows day'—has the support of the statisticians with their logistic curves. The thought is comforting, but it is fatalistic.

There existed not many generations ago in England, and there still exist to-day in India, a portion of the population who oppose sanitarian progress on the grounds that it is an interference with the workings of Nature. At this fatalistic attitude the sanitarians are horrified; yet to-day the majority of them are adopting an equally fatalistic attitude with regard to the population question. There is no need to worry, they say, for as certainly as night follows day, so will Nature adjust her balance. We are interfering up to a point, but for some mysterious reason we must interfere no more. Surely, it is in this attitude that the inconsistency lies. It would be as logical to reverse their motto and say 'Keep down the births and the deaths will keep down themselves'; but, as well as being inhuman, it would be entirely wrong. We must tackle both sides of the problem, or Nature will adjust the balance for us. But how? As she has done in the past, by her ruthless methods, under-nourishment and disease working hand in hand.

Reference may again be made to the striking case of Ireland which is far more instructive than any curves or theories. In Ireland the population in 1700 was 1,250,000, in 1800 it had increased to 4,500,000 and by 1841 it had swelled to 8,175,000. This remarkable increase appears to have become possible through the extension of cultivation of the potato. There must also have been a great diminution in the death rate during the 18th and 19th centuries, but there is no evidence whatever that the fall in the death rate was accompanied by the decline in the birth rate which some experts regard as being the inevitable result of a fall in the death rate. We know that a fall in the birth rate may be due either to the occurrence of an epidemic of a debilitating disease like malaria, or to the control of the birth rate by the deliberate action of individual members of the community, but we have no evidence of the working of some mysterious law of Nature by which a fall in the death rate is followed

automatically by a fall in the birth rate. The rates do fall simultaneously in many cases, but there is plenty of evidence to show that a deliberately-produced fall in the birth rate brings about the conditions which make a fall in the death rate possible, whereas a fall in the death rate does not by itself cause a fall in the birth rate. The case of Ireland affords very strong evidence that the population of a country, when not affected by other important factors like war, disease, emigration, industrial development, or artificial restriction, is ultimately limited only by the available food supply. When a population is controlled in this way the people are living precarious, enfeebled and unsatisfactory lives. The following passage in a book by Stephen Gwynne gives a vivid description of the people of Ireland when the population was near its maximum in 1840.

'In a parish with a population of 9,000, the only wheeled vehicle was one cart, there was one plough, sixteen harrows, twenty shovels, no pigs, no clock, three watches, no fruit trees; people slept naked on straw and rushes, men and cattle were housed together. The school teacher, a man of distinction, had a salary of £8 a year. The people had one meal a day, sometimes only one meal in two days. The poor became a teeming multitude, living on potatoes and a little milk. Over two million persons were in distress for more than half of every year. At least a quarter of a million were driven to beg on the roads before the potato harvest'.

Here we have a very graphic picture of what has actually happened in a country in which the people lived with no thought for the evils which result from a senseless increase in the population without a corresponding provision for feeding the extra mouths. The tragic story of the fate of the people when the potato famine came affords an example of the drastic action which had to be taken when dire necessity compelled the people to restrict the population so as to conform to the available resources of the country. Eventually, the population became stabilized at about four millions by the deliberate restriction of the number of births. The latest census of the Irish Free State shows that 80 per cent. of the males between the ages of 25 and 30 are unmarried, yet in spite of this there is great anxiety because of over-population. Have we any reason to believe that the same kind of disaster as happened in Ireland in 1846 will not occur in India if we fail to face the hard facts of human existence? We need not look so far back nor so far afield as Ireland to appreciate the nature of our own problem. Every one of us has numerous examples before his eyes of the impossibility of giving children a reasonable start in life when the unfortunate young parents have to rear a family of five or six on an income

which would barely support the father and mother in a proper state of nutrition.

Curves and laws have a fascination of their own, but they are dangerous distractions when they are allowed to divert our attention from the realities of life. It is certain that so long as mere children marry and attempt to bring up their families on incomes which cannot provide nourishment for their offspring it is not sufficient to preach to them about proper methods of feeding, clothing, housing and hygiene; these methods are absolutely beyond their reach and will continue to be so until the existing ignorance and prejudice are replaced by intelligence and foresight. It is essential to attack the root of the evil and this can only be done by teaching the people how to plan their lives in accordance with the dictates of reason. There is no example in the history of the world of a community having attained to a satisfactory existence without adopting a rational outlook on life. In progressive countries this outlook is created by impressing on the minds of the children that they are responsible for planning their own lives; the children are not allowed to marry until they have reached years of discretion: by that time they have been made to realize that they have no right to think of marrying and having children until they are able to give these children a fair start in life. Even under such conditions many of the children still have a hard struggle to achieve a satisfactory economic condition, but they have the advantage of being armed for the battle of life with healthy bodies and educated minds and so they have some chance of success. In India, on the other hand, mere children find themselves embarked on the responsibilities of parenthood under conditions in which it is quite impossible for them to succeed, they and their infants are doomed to a despairing attempt to keep body and soul together.

Can we get away from the inevitable nature of this tragedy? Is it surprising that half of the children perish miserably before they reach the age of five? Even if we succeed in preventing the deaths of the 35 per cent. who now die of preventable disease before reaching the age of five years, will the problem be solved? The claim of the experts that if we save the lives of the infants there will be a corresponding fall in the birth rate, is certainly not true in the case of individual families. It is sufficiently obvious that if an average of five children instead of three in each family reach the age of five years the struggle for existence will become intensified to a corresponding degree, and if we multiply the individual average family by millions we get a true picture of what would happen all over India. The same kind of struggle exists in the middle-class families in which an attempt is made to achieve higher standards of economic life; in their case

we have a more poignant drama because the actors in it feel their position more acutely, they realize that they have not had a fair chance and they show their resentment by hostility to the government which they have been taught to regard as being responsible for their miseries. Anyone who states facts like these is at once charged with being an advocate of contraception. We have never advocated contraception as the one solution of the problem, our point of view is that certain hard facts have to be faced and we have shown that some countries have achieved success by delayed marriages and celibacy, others by contraception.

It seems clear that the people of India are faced with three possible lines of action.

- (1) the adoption of later marriages and celibacy,
- (2) the practice of contraception,
- (3) the continued propagation of surplus infants with the inevitable result that the population will be restricted by disease, famine, and war.

The first and second methods seem to be the only satisfactory solutions and it is open to everyone to choose whichever of these is in keeping with his religious beliefs or inclinations: there should be no dictation or compulsion of any kind.

There is usually a good reason for long-established customs and it is quite likely that infant marriage was necessary and justifiable under the conditions which existed in ancient times. When war, disease, and famine levied a huge toll on the population the best chance for survival of a family or race lay in the production of large numbers of offspring at the earliest possible moment; but changing conditions call for changing customs and it is only those who adapt themselves to the existing environment who have a chance of success.

We have no figures to show the death rates in India in ancient times, but we do know that in London between the years 1730 to 1749 no less than three-fourths of the children died before they reached the age of five years; by the year 1800 the deaths were reduced to one half and by 1920 the rate had fallen to less than one in seven.

Two hundred years ago the only means of maintaining the population of London was by the production of large families but it is evident that if the people of London and England were to indulge in uncontrolled reproduction to-day the population would rapidly increase to such an extent that the food supply would soon fail, and, apart from wholesale emigration, the economic condition of the community would become worse than it is in India.

The experience of Japan is perhaps more applicable to Indian conditions than that of European countries. In Japan there is a strong prejudice against both celibacy and birth

control but there has been a determined effort to improve the conditions of life by improved sanitation; let us study the results which have been achieved.

The population of Japan remained almost stationary from 1723 till 1846 at 26 to 27 millions. In 1872 it had risen to 33 millions. In 1893 it was 41½ millions, in 1913 it had reached 53½ millions and in 1923 it was over 60 millions. It is still steadily rising and has increased by nearly 2½ millions during the three years 1926 to 1929. The figures given in the following table are interesting:—

		Japan	England & Wales
Birth rate	1886-90	28.5	31.4
	1929	33	16.3
Death rate	1886-90	20.7	18.9
	1928	19.8	11.7
	1929	20.0	13.4
Infant mortality	1886-90	11.7	14.5
	1929	14.2	7.4

	JAPAN			ENGLAND & WALES		
		Males	Females		Males	Females
Expectation of life at age under 1 year.	1908-13	44.25	44.73	1901-10	43.9	
	1921-25	42.06	43.20	1920-22	55.5	59.5

These figures show that Japan, a country which has attacked the problem purely from the point of view of improved sanitation while doing nothing to control the birth rate, has failed to secure any appreciable reduction in the death rate. The infant mortality rate has actually risen and the expectation of life has fallen.

In England on the other hand it is certain that the birth rate has been controlled deliberately and it is obvious that this has been a very important factor in bringing about the great reduction in the infant mortality and total death rate as well as the great increase in the expectation of life.

Leaving aside graphs and curves and applying commonsense to the problem this is exactly what one would expect to happen.

There is another criticism which must be referred to. We advocated the appointment of a commission to enquire into the unsatisfactory health and economic condition of the people of India. One critic pointed out that the recent Royal Commissions have not produced results commensurable with the expense involved. The critic admits that the gravity of the subject is undeniable, but he would prefer to see it dealt with as an urgent problem by the Federal Government and the constituent States at the earliest moment after the new constitution comes into force.

If we were dealing with a human being who is suffering from a complicated disease affecting

the whole body we should not expect to secure an accurate diagnosis by employing first of all a specialist whose knowledge is strictly limited to the heart, then one who knows only about the kidneys and so on; it is essential that a careful survey should be made of the body as a whole; a detailed examination of certain organs only is useless. The previous commissions have investigated agriculture, labour, finance, and the system of government as isolated units, none of them have studied the complex problem of the position as a whole.

The reluctance to investigate the problem is due, in part, to a failure to recognize the gravity of the situation, but it is due even more to the fatalistic view that nothing can be done except to let Nature take her course. Palliatives are prescribed from time to time when certain symptoms obtrude themselves, but no serious effort has yet been made to discover the real causes of the malady and to devise a rational course of treatment.

The question may be asked, have the medical and other scientists any reason to believe that a remedy can be found? The reply is emphatically, yes! but only under certain conditions; these are that the complicated disease should be thoroughly studied by competent experts working in close consultation with one another. Having made a diagnosis and agreed on a line of treatment the specialists must convince the patient that their diagnosis is correct and persuade him to adopt the long course of treatment which is essential. It is quite certain that the remedy will consist in education, especially of the boys and girls, but the system of education must be devised after the most careful study. The education must be directed towards the definite object of instructing the children in such a way that they will learn how to plan their lives so as to obtain the best chance of a satisfactory existence. The cure will take a long time, but the longer it is delayed the more terrible will be the problem which the future governments of India will have to face.

India is in much the same condition as Ireland was a hundred years ago, except that the problem of India is many times more vast, as we are dealing with three hundred and fifty millions of people instead of eight millions. What are we doing to prevent a tragedy from happening in India such as Ireland experienced during the potato famine? Failures of the monsoon, wars, great epidemics, these are the unpleasant remedies which Nature is sure to apply to a country with a population in excess of the food supply.

Under the British rule it has been possible to increase the productivity of India to such an extent that 350 millions of people are able to live under better conditions than 200 millions used to do. It is within the bounds of possibility that even so many as the present 350

millions might live in a modest degree of economic well-being if production were increased and waste eliminated: but is there anyone so optimistic as to claim that 700 millions could gain a reasonable livelihood? Yet this is what we appear to be aiming at so long as we confine our attention to the elimination of preventable disease.

It is just as well to forestall those critics who have already said, and are likely to repeat, that the logical outcome of the argument would be to shut down all effort for the improvement of public health. This criticism would be justified if the only course which is open to us is to confine ourselves to disease prevention and continue to live in other respects without using our reasoning powers in the regulation of our existence.

Apart from the deliberate planning of human existence on a rational manner the only important checks on population, as we have already said, are starvation, disease and war. If Nature is to be left in sole charge of the arrangements, then disease is just as kindly a method of controlling the population as famine or war. But seeing that the people of the other countries have succeeded in achieving satisfactory results by applying their brains to the problem it is surely worth while to see whether India cannot secure the same benefits. If this were done, hygiene and public health would come into their own, they would achieve the same results in India as in other countries. The matter is urgent; while we delay in taking action, the difficulties which have to be faced are increasing every day.

There is a prejudice against commissions, but the lack of success of previous commissions has been due to their enquiries having been directed to isolated phases of a malady which is affecting the whole body politic. Apart from the action which might be taken on the findings of such a commission its educational value would be well worth the cost, which after all may be very trifling. The revolution in sanitation which has been effected in England resulted from the report of a Royal Commission, but, if any one can suggest some better means of studying the problem and awakening the people of India to a realization of the seriousness of the present situation, his proposals will be welcome.

The view of an eminent biologist on the population problem is of so great interest that we attach to this note an extract from an article in *Nature* (April 4th, 1931) by Professor E. W. MacBride, F.R.S.

* * * *

If we take our own country, we find that in 1600 the population of England and Wales was about 5,000,000; in 1700 it was 5½ millions, in 1800 it was 9,000,000 and in 1900 it was more than 30,000,000. The enormous increase, in the nineteenth century is usually ascribed to the 'industrial revolution': that is, the introduction of machinery driven by steam for manu-

facture. This, it is argued, provided far more openings for employment, and consequently the poor produced more children. But Miss Buer ('Health, Wealth, and Population—the Early Days of the Industrial Revolution') shows that this is a mistaken deduction. The increase in population began before the 'Revolution': the birth-rate did not increase to any marked extent, but the survival-rate increased owing to the introduction of vaccination, modern sanitation, and a purer water supply. From 1880 onwards, the birth-rate began to fall, owing to the introduction of birth control methods amongst the well-to-do; but until the present day it remains undiminished amongst the lowest and least-skilled section of the population. By our grandmotherly system of doles, maternity benefit, etc., we are doing our best to encourage it. Forty years ago, this section of the population bred as it does now, but the great majority of the children died. To-day, however stupid, they survive and constitute an increasing proportion of the future nation.

Before the War, the increase in population was to a considerable extent relieved by emigration to the Dominions and the United States. To-day that door is closed; the United States will admit annually only a small quota, and the Dominions, for the present at least, none. England at the moment resembles a steam-boiler with an increasing pressure and no safety-valve. In Italy, Signor Mussolini is encouraging large families with the view of increasing the importance of the Italian nation. By his skilful development of the natural resources of Italy, room is at present being made for the increase. But it is obvious that this process will soon reach its limit, and then Italy will become another dangerous centre of tension.

The recent census of India revealed that an increase in the population from 320,000,000 to 350,000,000 has taken place in ten years. The Indian peasant always lives on the barest minimum of subsistence, which is all that can be wrung from his small plot of land. It makes one shudder to think of the intensification of that dull, sordid struggle and the consequent misery involved in the necessity of feeding 30,000,000 extra mouths. A distinguished Anglo-Indian friend once told us that in one of the islands of the Ganges delta three-quarters of the population were wiped out by an inundation; ten years later that island was distinguished by its prosperity over all the other parts of the delta. No wonder some cynics sigh for the good old days when, at intervals, life was diversified by plagues and invasions which produced temporary excitement and discomfort and relieved the pressure of population. This pressure is one of the results of British rule and British humanitarian sentiment.

Humanitarian sentiment acting in ignorance of the laws of biology is a most dangerous thing and produces devastating results. Compulsory birth control seems to us to be the only remedy capable of averting these results. Truly, though hardness of heart be given divine condemnation, Nature is equally severe on stupidity and wilful ignorance.

These are the opinions of an eminent biologist. We may say that we do not share his extreme pessimism, nor do we approve of the remedies he suggests, any more than we do of the fatalistic attitude that is being adopted in this country. 'Birth control', in its popular sense, is not the only remedy and we do not specifically advocate it; all we demand is that this aspect of the public health problem shall not be entirely ignored.

THE PASSING OF A PIONEER

WE regret to have to record in our columns the deaths of Sir David Bruce on November 27th, 1931, and of Lady Bruce on November

23rd, 1931. With this sad event there terminates a life-long fellowship and companionship of inestimable value to the cause of tropical medicine. It is sad and yet fitting that they should have died together, Sir David dying on the day of his wife's funeral.

David Bruce, one thinks, stood head and shoulders above all the research workers in tropical medicine of the last half-century. Perhaps his greatest talent was his originality; he could see further through a stone wall than most people, and when set a problem he could get down to the essentials and worry out the truth. Secondly, there was his perseverance, often in the face of great difficulties. Thirdly, his driving power and genius for organisation. It was these three elements that solved the sleeping sickness problem of Africa—perhaps the first instance of successful 'team work' in tropical medicine. On the other hand, he was but a poor technician; it was here that Lady Bruce came in; she was a skilled microscopist, bacteriologist, artist, and typist; many of her exquisitely-drawn colour plates of trypanosomes illustrate the *Reports of the Sleeping Sickness Commission of the Royal Society* and the *Annals of Tropical Medicine and Parasitology*. It is rare for genius to be mated to genius, but in the case of Sir David and Lady Bruce this was accomplished, with the happiest result for the cause of tropical medicine.

David Bruce was born in Melbourne in 1855, and was brought to Scotland as a child. He was educated at the Stirling High School, and Edinburgh University, graduated in 1881, and entered the Royal Army Medical Corps in 1883. As a medical student he was noted for his fine physique (at one time he thought of taking up the career of a professional footballer), and for his studies in field natural history—one of his earliest achievements being the discovery of the snow-bunting in the Grampians in Scotland.

Having passed into the Royal Army Medical Corps at the head of the list, Bruce married Mary Elizabeth Steele, the daughter of a doctor at Reigate, and was posted to Malta in 1884. In those days there were no facilities for medical research work, and Bruce and his wife—both ardent pathologists—had to purchase their own microscope and accessories. Here, in 1886, Bruce discovered the causative organism of undulant fever—the *Micrococcus melitensis*, and traced the infection in man to the milk of goats. His full report on this disease was published in 1889, and a joint commission appointed in 1904 by the Admiralty, the War Office and the Malta Government did little more than confirm Bruce's findings. In 1887 he was detailed by the Malta Government to investigate an outbreak of cholera, and the ultimate result of his observations was an official report stressing the necessity for better sanitation.

In 1889, at the early age of thirty-four, Bruce was elected a Fellow of the Royal Society and became assistant professor of pathology at Netley, a post which he held until 1894, when he was sent to serve in South Africa. Here in 1898 he was selected by the Governor of Natal to investigate 'nagana', a mysterious disease of cattle associated with a high mortality. The account of these investigations was published in the Croonian lectures for 1915 (*Lancet*, June and July, 1915). Bruce and his wife travelled for a month in an ox-cart to Ubombo in Zululand, undergoing considerable hardships, and finally set up a laboratory in a wattle and daub hut in which they both worked and lived. Here live stock introduced into the country rapidly succumbed to nagana; the African natives believed that the disease was in some way associated with the wild game, which might contaminate the grass or drinking water; on the other hand the European settlers believed that the disease was transmitted by tsetse flies, and Livingstone was so impressed by the importance of tsetse that he put a vignette of a tsetse on the title page of his *Missionary Travels* (1857).

Between September 1895 and May 1896 Bruce and his wife had solved the problem of nagana, and Bruce's final report is dated May 1896. The originality and supreme value of this work has been commented on by Mr. Clifford Dobell, M.A., F.R.S., Protistologist to the National Council for Medical Research in Great Britain, in the following terms*:

'Bruce began his work in Zululand—after an abortive attempt in 1894—in September 1895 (the month of Pasteur's death). His full report on his researches is dated May 1896. In this almost incredibly short space of time he demonstrated that nagana is caused by a protozoal blood-parasite—since named *Trypanosoma brucei*, after its discoverer; that the parasite lives normally in the blood of big game, without harming them; and that it is conveyed from animal to animal by the tsetse. When the fly sucks the blood of an infected animal it becomes itself infected with the trypanosomes, which are subsequently re-inoculated into other animals by the fly when it sucks their blood. If these other animals are domestic stock, such as oxen or horses, they become infected with trypanosomes, contract nagana, and die. If they are wild game, such as antelopes, they also become infected, but develop no disease. In nature the trypanosome lives in the game and the flies alternately, the fly acting as an intermediary in the spread of infection from antelope to antelope. The big game—indigenous in the country—are habituated to and proof against the infection; domestic animals—foreigners, introduced by man—are not, and when infected usually die.

Bruce thus succeeded in extracting elements of truth from both the European and the native beliefs, and was able to combine them into a true theory of the causation of nagana. At the same time he threw a flood of light on many other protozoal diseases, and suggested all sorts of possibilities concerning their causation and prevention. He forged new links between protozoology and medicine and between

* *Encyclopedia Britannica*, 12th edit. 1922, article on Protozoology, p. 190.

entomology and protozoology. It is true there were other lights and other links before. Trypanosomes were known, and known to cause diseases, before Bruce went to Zululand. Timothy Lewis and Griffith Evans had observed similar parasites in India more than a decade earlier; and Theobald Smith and Kilborne, in America, had demonstrated in 1893 that the disease of cattle known as 'Texas fever'—a disease also caused by a blood-inhabiting protozoal parasite—is transmitted from beast to beast by the agency of ticks. But Bruce's work was solid, complete, and demonstrative. By clean experiments and right reasoning he contributed more to science in a few months than hundreds who have followed up his work have since been able to contribute in many years. In work of this sort it is the quality, not the quantity, that counts. Later researches have but served to enhance the magnitude and difficulty of the problem which confronted Bruce in 1895; and to find a just parallel to the masterly manner in which he solved it, we must go back to Pasteur. There is, indeed, the same simplicity, the same directness, the same insight in the work of both these men. Their works are enduring demonstrations of the method of science: they are a delight to read, and illustrate on every page the favourite maxim of Boerhaave: *Simplex sigillum veri*.

The following-up of Bruce's discoveries and the working-out of details and consequences have led to the accumulation of an immense amount of new knowledge—protozoological, entomological, and medical. We can do no more than mention it here. We must, however, notice one of the first-fruits of his labours—the application of his results to the study of human diseases. This application was made mainly by Bruce himself. A few years after he had done his great work on nagana he attacked the problem of sleeping sickness, a human disease which has depopulated large areas of Central Africa. Bruce and his collaborators were able to show that this disease is similar to nagana. It is likewise caused by a trypanosome, which is conveyed to man by the bite of a tsetse-fly, and which is capable of living in other animals. In this case the parasite had been previously seen by Forde and Dutton, and by Castellani. But its relation to human disease and the part played by the tsetse in its transmission were first clearly demonstrated through the work of Bruce.

At this point the South African war broke out and Bruce returned to military duty. He was present at the actions at Elandslaagte and Laing's Neck, took a prominent part in the defence of Ladysmith, and served in the operations in the Transvaal and Cape Colony. He was mentioned in despatches in 1901, and was specially promoted to lieutenant-colonel in 1900, served on a commission specially appointed to investigate dysentery and enteric fever in connection with the war in 1900-1901, and was promoted to brevet-colonel in 1902.

In 1902 the Royal Society had sent out a commission to enquire into the causes and prevention of sleeping sickness in Uganda. Dr. (now Sir Aldo) Castellani, who had been appointed to this commission, had discovered a trypanosome in the cerebro-spinal fluid of 5 out of 15 patients suffering from sleeping sickness; this trypanosome was subsequently shown to be identical with that discovered by Forde earlier in 1902 in the blood of an African native suffering from 'Gambia fever' on the West Coast of Africa, which was studied by Dutton in the same year, and named by him

Trypanosoma gambiense. In the following year Bruce was sent out by the Royal Society to the Commission, accompanied by his wife as assistant, and Dr. David Nabarro. Bruce's first point was to confirm Castellani's discovery, and the same trypanosome was discovered in the blood of 20 out of 34 patients suffering from sleeping sickness. This finding was published in 1903, and proved that *T. gambiense* was the causative parasite of sleeping sickness.

From 1903 to 1914 the composition of the commission varied considerably, but Bruce was always its head and main driving force. He was posted in 1904-1906 to Malta again to study undulant fever; to Uganda in 1908-1910; and to Nyasaland in 1911-1914. India contributed two members to the Commission—Colonels Greig and Mackie of the Indian Medical Service. A long series of reports followed in which the whole ætiology and mode of transmission of the disease were described; these were published chiefly in the *Proceedings of the Royal Society (Series B)*, and were illustrated by colour plates executed by Lady Bruce (they are now so scarce that it is almost impossible to obtain a complete copy of them). At first it was suspected that the chief mode of transmission of the infection was by direct mechanical transference on the proboscis of the fly, but Kleine's work had suggested that cyclical development occurred in the fly, and the Commission soon found this to be the case and worked out the life-cycle in the fly. The general policy of prophylaxis adopted was to remove the native villages wholesale inland to a safe distance away from the tsetse breeding areas. And—immediately—an acute question arose as to what, if any, was the connection between *T. gambiense* and *T. rhodesiense* which cause sleeping sickness in man, and *T. brucei* which infects the wild game of Africa without causing symptoms, but causes nagana in domestic live stock. It cannot be said to-day that this problem has yet been wholly cleared up, though the consensus of opinion is that *T. brucei* of wild game is responsible for both *T. gambiense* and *T. rhodesiense* infections in man.

In April 1911 the Royal Society, at the request of the Colonial Office, sent out a second Commission to investigate this point, and Bruce was Director of this Commission from 1911 to 1914. It was this Commission which discovered *T. rhodesiense*, and carried out much very valuable work on the trypanosomiasis of animals. In the meantime Bruce had received the Royal Medal of the Royal Society, had received the C.B. in 1905, and a knighthood in 1908. He was also promoted to the rank of Surgeon-General in 1912 for his scientific service.

With the outbreak of the Great War in 1914 Bruce was appointed Commandant of the Royal Army Medical College at Millbank, and held

this post until he retired in 1919. Here he served as chairman of the War Office Pathological Committee and of the special committees for the study of tetanus and trench fever. The almost universal use of antitetanic serum in war wounds in France during the war was largely due to his advice. Later still he served on the governing body of the Lister Institute.

Honours he received, but not all that he deserved, nor were these accompanied by any more material remuneration for the services he had rendered to humanity; nevertheless, he did not complain, but was content to live on his small pension and to spend his last few years in modest and dignified retirement.

The death of Sir David Bruce raises the question as to whether we have seen the last of the individual pioneer worker in the field of tropical medicine. Have all the big discoveries been made, and does it only remain for team work to fill in the very numerous minor gaps? On the other hand, we believe that there still remains room for the independent worker with originality and forcefulness.

In conclusion, we cannot do better than quote the following appreciation of Sir David and Lady Bruce by Colonel A. E. Hamerton, who was associated with them in the Sleeping Sickness Commission (*Brit. Med. Journ.*, Dec. 5th, 1931, p. 1068):—

'The death of both Sir David and Lady Bruce within the same week removes from the field of medical research the rare and happy partnership of a man and his wife who, for nearly forty-eight years, together formed a brilliantly successful unit devoted to pioneer work in the investigation of tropical diseases. By their combination of talent and mutual interest in the work to which they dedicated their careers, they alone initiated and perfected early in their married life—with meagre laboratory facilities, and when bacteriology was in its infancy—a series of masterly experimental investigations that culminated in two outstanding discoveries—namely, in 1887 the isolation of *Micrococcus melitensis* and the proof that it was the cause of . . . ; some eight years later the discovery of *Trypanosoma brucei* and the proof that it was the cause of 'nagana', the fly disease of domestic animals in Zululand; also that the tsetse fly was the vector and the wild-game animals the definitive hosts of this lethal parasite. These great discoveries laid the foundation of a system of human and veterinary pathology and preventive medicine which they continued to illuminate until near the end of their lives, and which still occupies the minds of a host of investigators throughout the civilized world. Bruce's original reports on these discoveries are masterpieces of scientific reasoning based on experiment. They are as true to-day as when they were written, and—though the edifice of knowledge of which they are the base has grown immense—the original foundations were so well and truly laid that they have required no alteration. Happy is the man of science who can claim this to his credit!

Bruce was great, not because he was a supremely clever man in the common acceptance of the term—of whom it might be said, 'He could have risen to the top of any learned profession to which he applied his mind'—but because he was original in thought, and he was no imitator. He had a constructive imagination. His mind, however, worked slowly; he pondered deeply and saw far into those workings of nature that he investigated. Moreover, he had an indefinable

intuition, almost mystical in its working, that enabled him not only to discern amidst a maze of possible courses the right path of investigation, and to plan his experiments accordingly, but to stick to it and avoid futile experimentation that would lead only to a mare's nest. This faculty was of inestimable value in later life, when he became a director of teams of young workers on the various commissions for the further investigation of undulant fever, trypanosomiasis, and other diseases. He was quick to recognize any promising clue on data that emerged in the process of investigation, and to plan an orderly and conclusive line of experiments thereon. And he was just as quick to stop wasting time over experiments in which he 'saw no light', to use his own expression.

But Bruce was not a good technician; he did not appear to have the manual dexterity or the patience to master the finicky details of laboratory technique. Here Lady Bruce was supreme; as a microscopist she had few equals. She had a master mind and hand for laboratory procedure, ingenious in devising apparatus out of all sorts of odds and ends, skilled as a bacteriologist and typist. She was also an artist of no mean merit, and a critic of literary output. She was, moreover, a truly noble woman. She excelled in the practice of all the virtues, which radiated from her nature with most effect in times of trial and difficulty in Central Africa. She was the happy possessor of a rare mental make-up, comprising unusual ability, tact, commonsense in dealing with the ordinary affairs of life, and, above all, a real goodness of heart which inspired profound respect and admiration among all her colleagues on the Sleeping Sickness Commission. She had masculine courage and strength of character, with a suave femininity that had the best possible influence in promoting happy relations and harmony among all workers in the camp. She stands side by side with her husband among the immortals. The great work they did together in the service of humanity ranks with the highest, and remains an enduring monument in the Temple of Science.'

Medical News

THE NINTH POSTGRADUATE COURSE IN OPHTHALMOLOGY. VIENNA 1932

THE ninth special course for postgraduate study in ophthalmology will be given between October 1st and December 6th, 1932, under the auspices of the American Medical Association of Vienna at the I and II Eye Clinic of the Allgemeines Krankenhaus, Vienna, Austria.

This intensive postgraduate instruction was first originated in Vienna in 1922 as a result of a suggestion by Dr. Edward Jackson of Denver to Prof. E. Fuchs. Prof. J. Meller and Prof. K. Lindner, chiefs of the Eye Clinics, have again consented to take an active part. The other lectures will be given by Prof. A. Fuchs, the Docents Bachstetz and Dr. Urbanek, and Assistants Dr. L. Sallmann, Dr. Fischer, Dr. Böck, Dr. Rieger, Dr. Kreibitz, Dr. Subal and Dr. Pressburger. Professors, Docents and Assistants of other departments will deliver lectures in their respective subjects: Prof. Schüller on Röntgen-rays, Prof. Hirsch on the hypophysis and sinuses; Prof. J. Bauer on endocrine disturbances; Docent Kofler on the modified West-operation; Docent Fuchs on radium-treatment; Docent Pollitzer on embryology.

The course has been so arranged that the field can be covered systematically and comprehensively in the allotted time. A preliminary knowledge of ophthalmology is pre-supposed.

Concerning operations only lectures with demonstrations will be given. In refraction only advanced work will be given. In ophthalmoscopy the non-electric ophthalmoscope will be used.

The entire course is given in English for a minimum of ten, and a maximum of seventeen men. The fee is \$250 per man. Applications with a certified cheque for \$100 should be sent only to Prof. A. Fuchs, Vienna, VIII, Skodagasse 13. Applications are accepted in order of priority. The application fee will be returned if the application is cancelled before September 15th.

Further information can be secured by writing to Prof. Dr. A. Fuchs, Vienna, VIII, Skodagasse 13 or to the American Medical Association, Vienna, VIII, Alserstrasse 9, Café Edison.

The members meet on October 1st at 7-50 a.m. at the I. Augenklinik, IX, Alserstrasse 4, V. Hof.

THE INTERNATIONAL LEPROSY ASSOCIATION

An international conference of leprologists under the auspices of the Leonard Wood Memorial for the Eradication of Leprosy and the Leprosy Commission of the League of Nations was held in Manila, Philippine Islands, from January 9th to 23rd, 1931. At this conference it was decided to form an International Leprosy Association, which now has its headquarters at 29, Dorset Square, London, N.W.1; also to commence publication of an international journal on the subject. The membership of the Association is already well above 200, but Dr. Victor G. Heiser, the President, has appealed to us to broadcast information about the Association in the hope of enrolling new members. The annual subscription is 5 dollars, which includes the cost of the journal. The following are abstracts from the report on the conference, published in April 1931 as a supplement to the *Philippine Journal of Science*.—

DISCUSSIONS AND CONCLUSIONS

1. The International Viewpoint

An important cause of misunderstanding among leprosy workers is their insufficient appreciation of fundamental differences in conditions and practices existing in different regions. Leprosy has a wide range of manifestations and the predominating features, such as the frequency of one or another type, may vary widely in different regions. Local conditions of various kinds must determine the nature of anti-leprosy activities. The results of work may be influenced by such factors as the type of case, the degree of advancement of the disease, and the conditions under which the patient is observed. It is important that leprologists bear such factors in mind in order that they may precisely evaluate their own findings, particularly with regard to the work of others, and avoid the formulation of unduly broad conclusions.

Study tours.—It is deemed highly advisable that any country or institution undertaking serious work in leprosy should send some of its leading workers to one or more of the main centres of leprosy activities, in order to study the local conditions and the methods in use. The value of this lies not only in the knowledge acquired that can be applied directly to the visitor's own work, but also in the broadening of his outlook on the leprosy problem as a whole.

Transfer of workers.—It not infrequently happens that the results obtained by a worker or group in one country are not confirmed by those working in other countries. Whether this is due to peculiarities of conditions prevailing, or to the personal equation, or to other factors, is usually not apparent. Progress towards the clarification of questions of regional differences could undoubtedly be accelerated were it possible for persons who have carried out studies in one region to be transferred to another in order to continue or repeat such studies there or to undertake correlative investigations. It is deemed desirable to bring the possibilities of such a plan to the notice of institutions and organizations concerned with the study of leprosy.

Leprosy digest, or annuaire.—It is unquestionably difficult for isolated workers to gain from the available literature an adequate understanding of conditions prevailing in other regions. There is need of a reference work of the nature of a comprehensive leprosy

survey, or annuaire, which would afford a reasonably accurate summary of what is known of the leprosy situation in all parts of the world. It should include information regarding the extent and distribution of the disease in the various countries or regions, the predominating types, other factors that affect leprosy work, and the laws and regulations obtaining; it should also include statements of activities, lists and brief descriptions of institutions, and perhaps data concerning active leprologists. The existing information of this nature is widely scattered and incomplete. It should be collected, summarized, amplified where necessary, and brought up to date. The preparation and periodical revision of such a survey would be a laborious and somewhat expensive task, hardly possible except through the agency of an organization such as the Leprosy Commission of the League of Nations or an association of leprologists. The matter should, however, be given serious consideration.

Designations of Cases of Leprosy

The term 'infectious' case is much used, chiefly in connection with administrative measures. The use of this term is not recommended.

The term 'burned-out' case is often applied to arrested cases that show mutilations, contractures, etc. It is recommended that the use of this term be discontinued and that 'arrested with deformity' be employed.

The term 'leper' is felt to carry with it a definite social stigma. It is recommended that the use of this term be discontinued and that 'case of leprosy' be employed.

The Microorganism

Nomenclature.—There is considerable variance in practice in the formal designation of the organism of leprosy. Common practice countenances the informal use of the term 'bacillus' for rod-shaped organisms in general. The generic name *Mycobacterium* is now extensively used for the acid-fast group to which the organism of leprosy belongs. Therefore, while it is permissible to speak colloquially of 'the leprosy bacillus', it is recommended that it be not referred to formally as *Bacillus lepræ* (*B. lepræ*), but as *Mycobacterium lepræ* (*M. lepræ*).

Toxins.—Attention may be drawn to the fact that 'toxins' of *M. lepræ*, in the sense used in bacteriology, are hypothetical. It is a striking fact that a patient with extensive and progressive cutaneous lesions containing innumerable numbers of microorganisms may show no clinical indication of any kind of toxic effect. In the condition known as 'lepra reaction' toxic manifestations are seen, but there is reason to believe that these are not due to true bacterial toxins. In the present state of our knowledge it is advisable to avoid the use of this term.

Clinical Classification of Cases

The classification of cases of leprosy is an important but difficult matter. Even with the same viewpoint no two workers in leprosy may necessarily classify any large group of patients precisely alike, because of differences of interpretation and of skill and care in examination. Thus, the confusion arising from the present differences of viewpoint and practice makes it imperative that a serious attempt be made to arrive at some uniformity in this matter.

Primary classification; types.—Leprosy is a general disease; in no type are the lesions confined to a single tissue, and the demonstration of bacilli is not always possible by routine methods. All diagnosable cases are in a sense 'mixed', and in consequence any classification should be based primarily on the predominating clinical findings.

This Conference is in agreement that cases of leprosy should be divided into two major types, and that these be designated 'neural' and 'cutaneous'. The division is based on the following considerations:—

For clinical and pathological evidence it seems clear that the leprosy bacillus has a very special affinity for peripheral nerves. Clinically there are many cases

that, for practical purposes, may be considered essentially neural. They frequently have visible lesions of the skin, but in typical cases the bacteriological findings by the usual methods are consistently negative. However, it is the experience of some observers that in occasional typical cases bacilli may be found in the nasal mucosa, though in their clinical course neural cases differ markedly from those with 'leprotic' skin lesions. Therefore, regardless of the manner in which the bacillus has entered the body, the mechanism of the production of the skin disturbance, or the possible presence of the bacilli in other tissues such as the lymph nodes, it may be agreed that it is reasonable and useful to recognize a nerve, or 'neural', type of leprosy. It is to be realized that neural cases may become 'cutaneous' through the subsequent development of leprotic lesions of the superficial tissues.

On the other hand, pure leprosy of the skin does not exist as a type. It may be that in exceptional cases lesions of the skin, in which *M. lepræ* is demonstrable, may exist before lesions develop elsewhere; but there is reason to believe that in such cases the bacillus almost invariably becomes disseminated and causes lesions in other organs, especially the nerves. Furthermore in many cases that ordinarily would be classed as 'cutaneous' leprosy, a history of primary nerve disturbance can be obtained, and very often careful examination may reveal some degree of sensory disturbance and of nerve thickening. Therefore, on this evidence, such cases are strictly 'mixed'. Sooner or later, in the natural course of the disease, gross evidence of neural involvement (atrophies, mutilations, paralyses) may be expected to develop. Notwithstanding these facts, in order to minimize confusion, it is deemed desirable to class all cases with leprotic lesions of the skin as 'cutaneous'.

Cases that have once been cutaneous, but with important neural manifestations (that is, the old 'mixed'), and have improved until only the neural lesions or sequelæ remain, require separate recognition. If first seen in this condition they would ordinarily be classed as advanced neural, but they should be considered 'secondary neural' in contra-distinction to the 'primary neural' cases, which have never apparently been of the cutaneous type.

PROPOSED CLASSIFICATION OF TYPES OF LEPROSY

A. Main Types

Neural (N).—All cases that show evidence of actual or previous nerve involvement; i.e., alterations of sensation with or without changes in pigmentation and circulation, trophic disturbances or paralyses and their consequent results: atrophies, contractures, ulcerations. These are not accompanied by leprotic changes in the skin.

Cutaneous (C).—All cases showing leprotic lesions in the skin. Such cases may or may not show, at any given time, clinical manifestations of nerve involvement.

B. Subtypes (indicating degree of severity)

Neural—1 (N—1).—Slight neural: Cases with one or a few small areas of disturbed sensation, which may or may not show alterations of circulation or pigmentation, paralyses or trophic disturbances of minor degree.

Neural—2 (N—2).—Moderately advanced neural: Cases with extensive or numerous areas of disturbed sensation, not confined to any one part of the body; with paralyses or/and visible evidences of trophic disturbances: marked depigmentation, moderate atrophy, keratosis, bullæ, etc.

Neural—3 (N—3).—Advanced neural: Cases with more or less extensive areas of anæsthesia and marked motor and trophic disturbances; marked paralyses, atrophies, contractures, trophic ulcers, and mutilations.

Cutaneous—1 (C—1).—Slight cutaneous: Cases with one to a few leprotic macules, or a few small areas of infiltration, or nodules.

Cutaneous—2 (C—2).—Moderately advanced cutaneous: Cases with numerous leprotic macules, or fairly numerous or marked areas of infiltration, or nodules, frequently with lesions of the mucosa.

Cutaneous—3 (C—3).—Advanced cutaneous: Numerous or very marked leprotic lesions in various stages of development or retrogression, usually with lesions in the mucosa.

In all cutaneous types there may be varying degrees of neural involvement and such cases should be recorded to indicate the degree of this involvement; as, for example, C—2, N—1.

Secondary neural.—Neural cases that were formerly cutaneous, but from which the active leprotic lesions have disappeared.

Early Diagnosis of Leprosy

Special stress is to be laid on the importance of the diagnosis of early and slight cases of leprosy, and of their treatment, both from the point of view of prevention of the disease and of relief of the patient. The sooner a patient is put under treatment the more promising are the results and the less the danger that such a patient will infect others, if the prevailing view that the disease is transmitted from man to man be correct. This view the Conference upholds.

All persons responsible for the diagnosis of leprosy should, therefore, acquaint themselves with the signs and symptoms diagnostic of leprosy in its earliest stages.

Treatment of Leprosy

The treatment of leprosy that seems most likely to succeed includes both general and special measures. These measures should be adjusted to the nature of the individual case, and not applied indiscriminately.

General measures.—The general measures that appear to be most applicable do not differ materially from those used in other infectious diseases whose course is often of great chronicity. However, it is believed by physicians experienced in this disease that careful and persistent efforts to eliminate intercurrent affections which tend to reduce the general resistance of the patient are essential to successful therapy. Observations suggest that the adjustment of both the quality and the quantity of the diet may be an important therapeutic measure. It is also the belief of those with experience that other general measures, including personal hygiene, supervised or graduated physical exercise, occupational therapy, the stimulation of morale, and mental welfare are also of definite value.

Special measures.—Special measures include those that may stimulate the general healing processes, and those that attempt to effect the resolution of individual lesions. Such measures include the administration of drugs and the application of physical agents.

The drugs most widely used are oils or their derivatives. The oils in very common use are those of *Hydnocarpus wightiana* and *H. anthelmintica* (chaulmoogra group). The derivatives of these oils that are receiving most attention among clinicians treating leprosy are the ethyl esters of the respective fatty acids and the soaps (sodium salts) of these acids. Available clinical evidence indicates that the therapeutic value of these oils is similar, and this is true also of their derivatives. The choice of these for use in treating leprosy may therefore rest on other factors, such as the ease with which they may be procured, their cost on delivery, their purity and freshness, and their keeping qualities.

The ethyl esters have been intensively used in large treatment centres and are preferred by the workers in those centres, as well as by others. The preference for this derivative seems to be influenced by the fact that a process of its manufacture has been attained that permits of the repeated production of a stable, uniform, and standardized product; also by the fact that when administered by injection, it produces less local irritation than that caused by some other derivatives. The degree of irritation produced by the injection of the esters may be reduced by the

addition of metallic iodine (0.5 per cent.) to them. However, other workers have preferred to use either the oils, or the sodium salts of their fatty acids. These drugs, also, can be administered by injection, intramuscularly or subcutaneously. They have not been used sufficiently by intradermal injection to admit of comparison with the esters.

The methods of injection may be intramuscular, subcutaneous, intracutaneous, or intravenous. Selection will be influenced to some degree by the nature of the medicament used; for example, it is difficult to inject the oil intradermally, and the esters or a solution of the soap is preferable when this method is used. Attention is called to the fact that oils and esters should not be given intravenously. Recent evidence tends to show that lesions of the skin resolve more rapidly when treated by intradermal injections. The dosage of these various preparations cannot be arbitrarily established, but must be adjusted to the condition of the individual.

Other oils have been used in a manner similar to that adopted with the hydnocarpus group, but experience of their use has not been sufficient to permit of an appraisal of their value.

Current Topics

The Population Problem

By A. D. STEWART

LIEUTENANT-COLONEL, I.M.S.

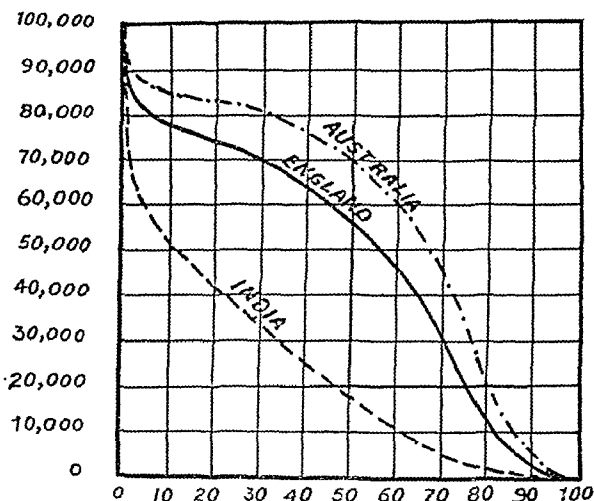
(Abstracted from the *Red Cross*, Vol. V, No. 3, July 1931, p. 139)

CONSCIOUSLY or unconsciously every intelligent human being has a creed which determines his career, his outlook on life and his conduct and his relationships to his fellow men. The creed of the hygienist is a firm belief in the upward progress of the human race, that this progress is being achieved generation after generation by intelligent application and practice of knowledge acquired by research and science; that everything done or undone through ignorance, apathy, mistake or deliberation to prevent or hinder this upward progress is a bar to civilisation's highest purposes. Professor Prausnitz says 'The progress of civilisation consists to a great extent in the more thorough and conscientious acceptance of responsibility for human life and health by the nations of the world and by the individuals who comprise these nations'. There are many sides to human

economic, mental, cultural, and moral. I believe is that while the human being and the human race must advance on all these lines, the first requisite is health, and that the knowledge of how to acquire and retain good health is fundamental in man's upward progress. India as well as the rest of the world is passing through a period of stress and many causes have been adduced—the question of 'over population' is an easy, familiar, and popular one. The implication is that there is not enough food for such numbers on the earth. Strange though it may seem the facts are apparently quite the reverse. There is at the present moment too much wheat in the Punjab, in Russia and in the United States and Canada, too much rice in Burma and in Siam, too much jute in Bengal, too much rubber and tin in Malay, too many cotton goods in Lancashire, too many motor cars in America. Why not reverse the argument and say that there are not enough people in the world at present to make use of the food and other things the world is producing? It seems as cogent as the other. In times of stress 'economy' is the first watchword of most people but 'not so', say other economists like Keynes—'spend and spend to the utmost of your ability and by doing so circulate goods and provide work for all'. It would appear that the real causes of our economic

trouble in India and elsewhere, and the remedies, seem to be eluding the best brains of the world: but it would also seem obvious that the population question at least does not explain everything and that we shall be doing a disservice to the advancement of a nation if we concentrate on it too much. Some of the fallacies and the dangers of the population argument are brought out in the recent editorial in the *Indian Medical Gazette* and in the comments in the *Statesman*. The writer in the *Indian Medical Gazette*, having apparently proved that at least one logical result of his argument would be a cessation of all maternity and child welfare work, says (rightly) that 'this is unthinkable', and then proceeds (quite rightly again) to develop a second argument for the necessity for a commission to enquire into the causes of ill health (including infant and maternal mortality) in India. Why not admit straight off that his logic led him to a *reductio ad absurdum* and that the logic or premises must have been faulty somewhere? The *Statesman* did not let him off his logic in this way. The writer in this paper pointed out that the supposed benefits of indifference to human mortality cannot logically be confined to the first year of life but must extend to all ages, lest the numbers of the population rise beyond 'nature's' level. This would lead to a negation of all medical work, both curative and preventive, and a surrender of human intelligence to the blind forces of nature. The *reductio ad absurdum* must be obvious to all thinking people.

Number of Male survivors at different ages out of 100,000 born alive in the countries named 1901-10.



The point is illustrated by the accompanying diagram which represents the progress of 100,000 newly-born individuals through a generation in India, Australia and England.

Any mathematician will explain that if one is proceeding down the Indian curve and has reached half-way nothing short of a miracle could jump him on to the Australian curve. In other words, to improve the curve of life, we must begin at its beginning and not only half-way.

The longevity of Australians is due largely to their small infantile mortality.

To get back to the population question and its relation to birth rates. In most European countries—at least those in which there has been a definite rise in the standard of living, and progress in health—there has been a distinct downward trend of birth rates and death rates during the last 50 years. The rate of fall in death rates has been greater than in birth rates.

Death rates began definitely to go down in England about 1870, about the time that Chadwick issued his classical report on the sanitary conditions of the working classes in England. Public health legislation and concerted action by government and the people for public health date from this year. Birth rates began to decline at a later date—about 1880.

Followers of Udney Yule and Raymond Pearl accept the logistic curve of population growth for all countries. In countries with high birth rates the population is kept on or near the curve usually by comparatively high death rates. Where the standard of living is high, the same result is achieved by a reduction in both death rates and birth rates. There is no doubt that a rise in the standard of living in India (which means improved health and less epidemic disease), will be accompanied by lessening death rates and birth rates. There are the three factors, (1) a rising standard of living and all that it implies, (2) falling death rates and (3) falling birth rates related to each other; which follows which? There has been a great controversy over these factors and large books have been written round them. There is a school which holds that a rise in the standard of living biologically leads to lessened fertility, i.e., decreased birth rates. There are cogent arguments for this point of view. Some hold that a decreasing birth rate is a necessary preliminary to increased welfare. Another view is that better living and falling death rates are concomitants, and that falling birth rates follow these, as the night the day. Personally I incline to the last view for which there is a great deal of support from a study of English and other vital statistics. India is too huge and heterogeneous a country for statistical analysis. Some recent investigations of vital statistics in Bengal by Dr. Bentley have shown that in practically every district in Bengal from 1908 to 1927 the birth rate has fallen by percentages varying from 34 per cent. to 5 per cent. and that there has also been a downward trend of death rates, though not to so great an extent as in birth rates.

In Bengal at any rate, birth rates have been on a downward tendency for the last 26 years.

I am convinced that the surest line of advance for the people of India is a reduction of death rates at every age period and all that this implies, concentrated action by government, local bodies, and the people themselves. Death rates do not come down by governmental action alone; the people must learn, practise and co-operate. In doing so they learn the lessons of better living all round. Birth rates will then automatically come down. In other words, look after the death rates and the birth rates will look after themselves. To tackle India's problem by focusing attention on birth rates alone is to my mind a wrong point of view; it is putting the cart before the horse and it was not in this way that sanitary and social progress was attained in England and other countries.

A Clinical Study of Acute Appendicitis in Old Age

By J. LEWIN

(Abstracted from the *British Journal of Surgery*, Vol. XIX, No. 73, July 1931, p. 63)

It might well be supposed that the last word had been said on the subject of appendicitis, but during the past few years my attention has been drawn forcibly to a considerable number of cases of a uniform but very anomalous type occurring in people in advanced years. The picture presented is so constant that I find that such cases may be confidently diagnosed from the other conditions which they mimic. As they are not even mentioned in the textbooks, I have ventured to present this short clinical study with the hope that it may be of some assistance to those who are confronted with similar cases. The anatomy and ætiology of appendicitis will not be discussed, but

consideration given only to the clinical manifestations of the disease which are peculiar to old age.

I am aware that any definition of old age must be, to a large extent, an arbitrary one. It is frequently stated that acute appendicitis is rare in old age, but in my own experience this is far from being the case, and though 60, which I make the lower limit, may seem somewhat drastic, it does include every case in my series, each of which is a manifestation of the declining power of the body to contend with bacterial infection. In the last three years I have had twelve such cases, in addition to at least as many more which presented symptoms comparable to those encountered in the large run of cases in young people. It is clear, therefore, that appendicitis in old people is far from being a rarity. Of my twelve cases, nine were men, and three were women, and their ages were: 62, 63, 64 (2 cases), 69 (2 cases), 71, 72, 73, 74, 75, and 86.

The underlying factor in all these cases is the alteration in the reaction of the tissues concomitant with old age. This alteration is general in all parts of the body, and is characterized by a tendency to chronicity following on a lengthened period of development. It is seen in both the reaction to infection, and—what is equally important—in the delay of healing processes. As a clinical illustration of the first, one may cite senile tuberculosis of the cervical glands, and of the second, the greatly increased time necessary to produce adhesion between two layers of peritoneum. It is, indeed, the behaviour of the peritoneum that accounts for many of the anomalous cases of appendicitis under consideration.

Before going more fully into the symptomatology of the clinical types, there are certain features which are common to nearly all cases. There is, first, a much longer history than is usually obtained, and it is not uncommon for seven or eight days to elapse before the symptoms become acute enough to force the patient to seek surgical aid. This is in marked contrast to the customary twenty-four or forty-eight hour illness with which we are confronted. The average length of history in my cases was between five and six days. There is far less constitutional disturbance, and the amount of pyrexia is unusually small. Pain is comparatively less when due solely to the inflamed appendix, and when marked is the result of secondary peritonitis and distension. All visceral processes are considerably slowed, and constipation is the rule.

The majority of cases fall into a group presenting nearly all the signs and symptoms of acute or sub-acute intestinal obstruction, rather than an acute inflammatory lesion. There is a history of constipation lasting seven or eight days, the patient passing neither faeces nor flatus. Even more striking in this regard is the failure, often experienced, to produce any relief by repeated enemata, a circumstance strongly suggestive of an organic obstruction. Equally misleading is the history, sometimes given spontaneously by the patient, of increasing difficulty extending over a period of several months.

Vomiting is not a constant feature, but quite often occurs at the onset of the illness, subsiding completely by the time the patient is seen by the surgeon. This is rather in favour of an inflammatory as opposed to an obstructive lesion. The amount of pain varies, but is mostly the outcome of abdominal distension, and its distribution is a wide one, over the whole of the lower half of the abdomen. Not infrequently the pain and tenderness are most strongly marked in the left side, due largely to the upward displacement of the pelvic coils of distended ileum. The abdomen as a whole is markedly distended and resonant. The tongue is dry and furred, and the breath offensive. On rectal examination the bowel is found to be empty, and the frequent failure of enemata to bring relief shows that this emptiness extends far above the portion within reach of the examining finger.

What we are confronted with in reality is an acute infective process in which the local reaction is so slow and mild that by the time the patient seeks surgical

aid the original disorder is masked almost entirely by a new one, which is no more than a complication of it. Doubtless if these cases were seen in the early stages, the difficulties of diagnosis would be far less. That they are not seen is only a reflection of the mildness of the initial symptoms.

The diagnosis of these cases is always difficult, but there are a few points which, borne in mind, may enable us to arrive at the correct conclusion. First of all, although apparently superfluous, I would suggest that acute appendicitis should be considered as a possibility in all cases of acute or subacute intestinal obstruction. Secondly, the distribution of pain and tenderness should not be allowed to influence the diagnosis too much. I have already mentioned that left-sided pain and tenderness sometimes are predominant. I should like to stress this point, as it is of frequent occurrence, and due, as I have repeatedly confirmed at operation, to distended and inflamed coils of ileum which have risen from the pelvis. In old people, therefore, we are faced with this seeming paradox, that in such cases of acute appendicitis the local reaction is comparatively so small that maximum pain and tenderness are left-sided and due to a secondary distension, whereas in cases of true organic obstruction in the large bowel, maximum pain and tenderness may be, and often are, right-sided, owing to the easily distended cæcum.

A third point in the diagnosis is the presence of pyrexia, which, though comparatively little, is definitely in favour of an inflammatory lesion as opposed to a purely obstructive one. Vomiting is less marked than would be expected in an obstruction with the same degree of distension.

No single one of these signs is sufficient evidence on which to make a diagnosis, but by bearing them all in mind, I believe that in nearly all cases one can arrive at the right conclusion.

The intra-abdominal findings at operation are worth recording, as they shed considerable light on the peculiar signs and symptoms. I have already made some reference to the appendix itself. The most striking feature is the freedom from adhesion to surrounding structures and omentum, even after an illness of over a week. It may have a patchy covering of thin lymph, which spreads on to the cæcum and terminal coil of ileum, but there is no complete shutting off, so that a way is clear for the passage of pus and exudate into the pelvis and general peritoneal cavity.

Where peritonitis is present, the pus is often of an unusual nature, being very scanty and extremely greasy, yet forming a thin film over the whole pelvic contents. It is more common to find this condition than an excess of exudate. The pelvic coils of small intestine, as already noted, are injected and distended secondarily to pelvic peritonitis, but occasionally the distension may be partly due to a mechanical obstruction at the ileo-cæcal angle by attempts at forming adhesions in the vicinity of the primary infection. The distension of the ileum in these cases never seems to call for active relief, and subsides quite quickly when the abdomen is drained.

The treatment of these cases is always operative, and the abdomen should be opened by a mid-line incision. Owing to the absence of adhesion, the appendix can nearly always be delivered easily and safely. The peritoneal cavity should always be drained adequately, preferably by corrugated rubber sheeting. If removal of the appendix is difficult, or unwise in view of the patient's general condition, it may be safely left and drainage alone instituted. Although a less desirable procedure, it does not affect the prognosis materially. I have several times been obliged to leave the appendix, but have not lost a patient by so doing.

The prognosis is, on the whole, quite good, taking into account the age of the patient and the poor reaction which is so typical of the class under consideration.

Intravenous Urography with Uroselectan

By JOHN DUFF, M.D.

(Abstracted from the *Urologic and Cutaneous Review*, Vol. XXXV, No. 7, July 1931, p. 452)

THE synthesis of uroselectan for intravenous urography must be regarded as the most important accomplishment of this decade in urology. The discovery of this substance was not an accident, but rather the successful termination of a carefully planned research. The problem was to find a non-toxic drug which, when introduced into the blood stream, would be excreted by the kidneys in sufficient concentration to cast a radiographic shadow, thereby visualizing the urinary tract. Suffice it to say, but not to minimize in any way the efforts of Binz, Swick, Heckenbeck and Hughes, the problem was recently solved in Professor von Lichtenberg's clinic, St. Hedwig's *Krankenhaus*, Berlin, Germany. It seems quite fitting that this should be so, as mechanical or instrumental pyelography was originally introduced by von Lichtenberg and Volker in 1905—a quarter of a century ago.

Uroselectan contains 42 per cent. of organically combined iodine and the formula is that of a sodium salt,—2-Oxy—5—Iodopyridin—N—Acetic acid. It is freely soluble in water and when injected intravenously is excreted by a functioning kidney in sufficient concentration to give contrast on an x-ray film. No attempt will be made in this paper to discuss in detail the chemistry of uroselectan. The fact remains that at last we have a satisfactory substance for intravenous administration, which, when excreted by the kidney, casts an appreciable radiographic shadow.

Visualization of the urinary tract may now be accomplished mechanically or physiologically, but whether one or both methods should be used depends upon a careful consideration of all the facts at hand. If we use uroselectan intravenously and take Roentgenological advantage of its excretion by the kidneys we will obtain a more nearly anatomically correct picture of the pathological and physiological condition of the urinary tract than if we mechanically inject an opaque substance under pressure into the ureters and pelves of the kidneys. However, physical intravenous urography will never replace mechanical urography because when there is no kidney function uroselectan is not excreted and therefore a definite diagnosis of the pathology present cannot be made. Uroselectan, however, does not give the accuracy and clearness of detail in filling defects and outline as does sodium iodide injected through ureteral catheters. Moreover, uroselectan is expensive, and many films and much time must be expended in each case.

Uroselectan is particularly valuable when there is partial or complete obstruction of the ureter due to stone, stricture or tumour. Its contrasting shadow on the film is then quite dense due to the mechanical retention and concentration of the substance. In many cases of marked hypertrophy of the prostate with intravesical intrusion, a stricture of the urethra and severe cystitis, intravenous pyelography is a welcome procedure. We know that all unnecessary instrumentation should be avoided in cases of tuberculosis of the urinary tract. Therefore, intravenous uroselectan is the method of choice when the diagnosis has been established. The urologist will likewise find it most satisfactory when a complete examination of an hysterical adult or nervous child is indicated. Uroselectan is not an infallible urological oracle, but rather a welcome addition to our diagnostic armamentarium.

Von Lichtenberg states that by considering the appearance time, the intensity of the shadow, the quantity excreted in the urine, the specific gravity of the urine, the iodine content of the urine and the retention of the substance in the blood a fair idea of kidney function can be obtained. He apparently is of the opinion, however, that much work is yet to be done before intravenous uroselectan may be regarded as a practical test for kidney function.

Incidentally, Swick and Heckenbeck, von Lichtenberg says, found that 90 per cent. of the injected quantity is eliminated by the kidneys—most of it during the first two hours. Ureteral catheterization with collection on a urine specimen from each kidney for urea estimation; the subsequent intravenous injection of phenolsulphonaphthalein and its percentage determined in the separate specimens, will for some time to come be the most reliable method of determining the function of each kidney.

The preparation of the solution for intravenous injection is very simple. Double distilled water should be used. While the contents of the original bottle (40 grammes) is being slowly poured into 120 c.c. of water it should be stirred diligently. When completely dissolved the solution should be filtered twice through a fine filter paper and boiled for 20 minutes, allowed to cool to body temperature (almost 100 c.c. will remain) and injected intravenously. We have found that the solution is fairly stable and may be kept in a refrigerator for 48 hours with very little impairment of its efficiency, although it is undoubtedly better to inject the fresh solution.

At the James Buchanan Brady Foundation of Urology of the New York Hospital we have had no serious reaction following the intravenous injection of uroselectan. The patients usually state when questioned that they feel warm in some particular part of the body, occasionally they feel warm 'all over'. In two or three cases there was some nausea but no vomiting. One woman developed a slight cellulitis or phlebitis for a short distance along the vein which was injected, but her arm was very fat and the veins small. Last summer I spent several weeks in von Lichtenberg's clinic and saw no untoward results in over a hundred cases in which uroselectan was used. He reported only last week at the meeting of the American Urological Association in New York, 700 cases with no serious or fatal results, although he does note 8 cases of phlebitis at the site of injection, evidence of the local inflammation appearing several days after the injection.

Binz ascribes this lack of toxicity to the fact that the iodine in uroselectan is in an organically combined form which passes unchanged through the blood stream and is almost entirely excreted by the kidneys in the urine.

At the New York Hospital in the immediate past we have taken the first film in five minutes after the injection, the second in 15 minutes, the third in half an hour, the fourth in one hour, the fifth in two hours and the sixth in three hours. This rather elaborate technique has been followed in order that nothing of interest might escape us, but lately it has been slightly modified. Von Lichtenberg recommends that the first film be taken in 15 minutes, the second in 45 minutes and the third in 1½ hours. Our experience has been that in the average case the best picture is obtained in thirty minutes after injection.

Premedication

By STANLEY ROWBOTHAM, M.R.C.S., L.R.C.P.

(Abstracted from the *British Medical Journal*, 17th October, 1931, p. 693)

For the purpose of this discussion, by *premedication* is understood a new conception of pre-anæsthetic medication, whereby the patient is rendered unconscious in his bed before the administration of the anæsthetic. The method has been aptly named *basal narcosis*.

It is no longer necessary that a man about to undergo an operation shall first of all be subjected to the ordeal of being taken from his bed to the theatre, compelled to witness the preparations for his operation, and then undergo the unpleasant experience of inhaling the anæsthetic until the last threads of his dissociating consciousness finally break. Neither is it necessary that when he once more awakens he shall reek of the anæsthetic, nor be distressed by hours of vomiting.

I propose briefly to consider the several groups of drugs, mentioning their characteristics. I shall purposely refrain from expressing any opinion as to the comparative value of the different drugs until the end, so that the descriptions may be as unprejudiced as possible.

PARALDEHYDE

Except in young children and very old and debilitated subjects, paraldehyde alone will not produce unconsciousness. The addition of morphine or some other such drug is needed. Patients are graded into four groups. (This classification may also be of help in deciding the dose of other narcotic drugs).

Group I.—Children under 7. Debilitated or severely toxic subjects. Patients with a high temperature.

These cases receive 1 drachm of paraldehyde per stone weight three-quarters of an hour before operation. The solubility of paraldehyde in water is 1 in 10, so that every drachm of paraldehyde is dissolved in 10 drachms of warm saline. This is shaken hard in a bottle to ensure solution and run slowly into the rectum by catheter and funnel; the rectum having been cleared by saline enema at least two hours previously. If the patient becomes unconscious during the introduction of the solution further administration is stopped; but this only applies to Group 1. Atropine is given hypodermically where an anæsthetic other than gas and oxygen is to follow.

Group II.—Normal adults and children over 7. One and a quarter hours before operation the patient receives hypodermically morphine gr. 1/40 for every stone weight, followed in fifteen minutes by rectal paraldehyde, 1 drachm per stone weight.

Group III.—Alcoholics. Athletes over 25 years of age. Very nervous patients. These patients receive on the night before operation (repeated during the morning, if the operation is in the afternoon) a full dose of bromide and chloral or bromidia. One and a quarter hours before operation: morphine, gr. 1/40 per stone weight, combined with hyoscine hydrobromide, gr. 1/150-1/100 hypodermically. One hour before operation: paraldehyde, 1 drachm per stone weight.

Group IV.—Thyrotoxic cases. A preliminary trial of the patient's reaction to hyoscine should be made some days previously as it sometimes causes great excitement. Preliminary sedatives—bromide and chloral, and morphine and hyoscine (if not contraindicated)—are given as for Group 3. Owing, however, to the fact that paraldehyde may not be sufficient to produce sleep, it may be necessary to follow on with ether. The paraldehyde is, therefore, dissolved in olive oil—half an ounce of oil to every drachm of paraldehyde—and if the patient be still awake half an hour before operation, one half to two ounces of a 50 per cent. mixture of ether and olive oil is run into the rectum, in half-ounce doses, at intervals of five minutes, until he falls asleep. This is not, of course, an unvariable dosage: it is necessary to sum up a case, and a certain amount of experience is necessary. Most patients retain the rectal injection without trouble, but a suppository of chloretone gr. x is of help in this respect. The average case is asleep in from 20 to 25 minutes, but some take as long as 45 minutes; the rate of absorption from the rectum varies.

AVERTIN (TRIBROMETHYLALCOHOL)

Avertin is a white crystalline powder which is only soluble 1 in 28 of water. If heated above 40°C. it decomposes and dibromacetaldehyde is formed, which will cause injury to the rectal mucosa. Like paraldehyde, it is administered by the rectum. Immediately before use the solution must be tested to make certain that no decomposition has occurred. For this purpose Congo red 1 : 1,000 solution is recommended by the manufacturers. It should remain orange red. Any trace of blue tint would indicate decomposition, and the solution should be discarded.

Avertin is very quickly absorbed by the intestinal mucous membrane. It is largely excreted through the kidneys, and to a less degree by the liver. It was

originally available only in powder form, and the time required for the preparation of the solution was a great disadvantage. The manufacturers now sell a solution which is kept stable by the addition of amylene hydrate. Each c.c. of the solution contains one gram of avertin. From this a 2½ per cent. solution is prepared with distilled water at 35°C. Dosage varies from about 0.05 to 0.15 gm. per kilogram body weight, the average dose being about 0.1 gm. per kilo.

Using the classification already described my average dosage was approximately as follows: Group I, 0.05 to 0.08 gm. per kilo. Group II, 0.1 gm. per kilo. Group III, 0.12 gm. per kilo. Group IV, 0.12 with the addition of morphine, hyoscine, etc. I have never exceeded a dose of 0.12.

An enema the night before is desirable but not absolutely necessary. Morphine given an hour before operation enables one to obtain narcosis with smaller doses of avertin, but is objected to by some workers on account of respiratory depression.

The solution is very slowly run into the rectum half an hour before operation. Excitement is rare, and the patient very quickly goes to sleep in a natural manner; but narcosis progressively deepens for another ten to fifteen minutes. It is quieter and deeper than that of paraldehyde. The patient is relaxed and will more easily lose his airway. In many ways it reminds one of chloroform anaesthesia.

Contraindications are few. Disease of the kidneys and liver, rectal disease, and advanced pulmonary tuberculosis are the chief ones mentioned by German writers; but the patient's condition and the degree of toxæmia present must, of course, be the real guiding factors when deciding for or against the drug.

Recovery of consciousness occurs usually in from 1 to 4 hours; the period depends largely upon the amount of morphine and the anaesthetic used. Restlessness is rare. Frequently there supervenes a period during which the patient, though lying quietly with eyes closed, can talk and take drinks, etc., but will afterwards remember nothing of what has happened during this time. Vomiting rarely ensues, but if it does it is not remembered.

I have, unfortunately, three other cases to report when the patient died. The first two occurred in 1929—using an early sample of avertin which I obtained from Germany. The third had avertin fluid. The cause of death is not very evident. I am sure the solution of avertin was correctly made and tested; probably the error occurred in gauging the dose, and as will be seen, two were bad risks. Avertin is said to be excreted as bromine, which, in common with the other halogens, I believe is prone to attack the liver.

Last year I anaesthetized a man of 61 for partial gastrectomy—he had avertin (no morphine) followed by ether. His condition was satisfactory until two days after operation, when he collapsed with signs of pneumonia. The only post-mortem findings were hypostatic pneumonia on both sides, and fatty infiltration of the liver throughout. Something akin to delayed chloroform poisoning may be possible. Combined with morphine the respiration becomes depressed; in fact, the condition of the patient reminds one very much of chloroform anaesthesia—shallow breathing, soft pulse, absolute relaxation.

Man aged 68.—Operation for carcinoma of tongue: insertion of radium needles. Heart, second pulmonary sound accentuated, nothing else abnormal. Systolic blood pressure, 120. Lungs, chronic bronchitis and emphysema. Weight, 10 st. 2 lb. 11 a.m., omnopon 1 c.c. (= gr. ½), atropine gr. 11-30, avertin 6.0 grams in distilled water 240 c.c. (This is 0.3 gm. less than 0.1 gm. per kilo). Asleep on arrival at theatre at 12-15. No anaesthetic needed—patient moved once or twice when needles were inserted, but not enough to prevent, or delay, the operation. Systolic blood pressure 70, pulse 90, volume fair. Patient never recovered consciousness. He became cyanosed in spite of the administration of oxygen, and his pulse became more

and more feeble, until he finally died at 2 a.m. next day.

It is perhaps hardly fair to blame avertin for death. The man obviously had too much omnopon and avertin, as shown by the fact that he needed no other anaesthetic. There may also have been another factor—obstructed airway. Usually tongue cases are intubated and the tube left in until the patient's reflexes have returned and he will no longer tolerate it. In this case no intubation was done; the patient maintained his own airway whilst in the theatre, and the house-surgeon assured me that there was no evidence of obstruction to breathing afterwards.

Woman aged 27.—Operation: appendicectomy. Heart and lungs, normal. Weight 11 st. 4 lb. Healthy woman. 12 noon, morphine gr. ½ with atropine gr. 1/100 12-15 a.m., avertin 7.2 gm. in distilled water 290 c.c. (0.1 gm. per kilo). 12-40 a.m., patient asleep; pulse full and regular; no blood pressure records taken. Anaesthetic, nitrous oxide-oxygen-ether. It was necessary to give ether practically the whole time to obtain relaxation. Patient returned from theatre fit, but she never recovered consciousness, her pulse gradually became more and more feeble, and in spite of every restorative measure she finally died at 3 p.m. the following day, 26½ hours after the administration of the avertin. Unfortunately we were unable to obtain a post-mortem examination.

Woman aged 63.—Operation for exophthalmic goitre. Heart, enlarged 4½ in. to left of mid-sternal line. Pulse on admission 120, on day before operation 84. Blood pressure, 138/78. Report from physician-in-charge electrocardiographic department: 'no contraindication for operation'. Basal metabolism rate + 46 per cent. Considerable loss of weight. Weight 8 st. 7½ lb. Typical thyrotoxic patient. 1 p.m., morphine gr. 1/15 with atropine gr. 1/100. 1-30 p.m., avertin fluid 5.4 c.c. (0.1 c.c. per kilo) in distilled water 218 c.c. 2-0 p.m., patient not asleep on arrival at theatre. Nurse reported some of avertin solution returned; therefore hyoscine gr. 1/100 given hypodermically. Anaesthetic: bilateral paravertebral cervical block, 2 per cent. novocain with adrenaline 1: 400,000. During the operation it was necessary to give a little gas and oxygen to keep patient still. Patient opened eyes and looked round in a dazed way before leaving theatre. Continuous oxygen and rectal saline given (routine) on return to ward. 5 p.m., unconscious, pulse 140, irregular, cardiazol and digitaline given. 8-30 p.m., breathing shallow; pulse 160, irregular. Lobeline, CO₂ and O₂ given, also digitaline, with very little effect. Pulse and respiration became feebler and feebler and patient died at 9-45 p.m. No post-mortem examination.

THE BARBITURATES

There are many barbituric acid compounds in use and they vary greatly in toxicity. Two facts which are important with regard to the effects produced by the barbiturates are: (1) The more toxic the compound, the smaller the dose required to produce a hypnotic effect; and the more rapidly is that effect produced. (2) The smaller the dose, the shorter the period during which the drug will act; and the more rapid will be its elimination from the patient's system.

The barbiturates have been used in various forms for many years; they are essentially hypnotic drugs and only produce anaesthesia in large and dangerous doses. Used as basal hypnotics the optimum dose is comparatively easy to judge, especially when given intravenously; but it is a different matter if the deeper stages approximating to anaesthesia are intended; it is very easy to administer an overdose. Morphine given beforehand increases their action, and smaller doses are needed to produce unconsciousness. As a general rule the systolic blood pressure is lowered some 20 to 30 points after the intravenous administration of a barbiturate, slightly more than this if morphine has been given. In many of my cases the blood pressure returned to normal within about ten minutes. It can always be raised by the inhalation of a little ether.

The hypnotic state resulting from the administration of a barbiturate has been divided into three stages. These merge one into another, and in the transition either into, or out of, complete unconsciousness a patient may pass through each stage; but absorption or elimination may be so rapid that the stages are indistinguishable. These stages are:—

1. Complete unconsciousness. Only obtained when a dose sufficiently large to be effective has been administered. The corneal reflex is sluggish or lost, but unless considerably more than a hypnotic dose has been administered, the patient will respond to painful stimuli.

2. A stage of semi-consciousness, during which a patient can be roused, will take drinks, and speak, but will lapse into sleep again when left alone. Some few cases (especially children) become restless in this stage; this may vary from slight movement to great excitement requiring forcible restraint. The patient has no memory whatever of events which have taken place during this period.

3. A period during which the patient is quite conscious, but feels drowsy and will sleep if left alone.

Elimination of Barbiturates

I am unable to learn anything very definite about the elimination of the barbiturates. Probably they are excreted by the kidneys, after having been broken up by the liver. I gave 4½ grains of nembutal by mouth to a patient who was suffering from toxic jaundice. He fell asleep immediately, and we were able to extract several teeth without an anæsthetic. He remained unconscious for 10 hours and drowsy for two days. The probable explanation of this appears to be that his liver was unable to deal with the drug.

An antidote has been stated to be caffeine sodium benzoate. I administered this to a woman who had taken a large amount of dial. She was deeply unconscious, with no corneal or other reflexes. I gave her caffeine 0.5 gm. with sod. benzoate 0.5 gm. intravenously, and although she did not regain consciousness immediately, her corneal reflex returned, and she moved when pricked with a needle immediately afterwards. Thyroxine, by raising the metabolic rate, is also said to hasten elimination. Zervas reports that animals given fatal doses of sodium amytal died of respiratory failure which usually precedes that of the circulatory system, though failure of both sometimes occurs simultaneously—particularly if the drug is injected rapidly.

Administration of Barbiturates for Basal Narcosis

The three barbituric compounds which have lately been employed as basal narcotics are:—sodium amytal (sodium iso-amyl-ethyl-barbiturate); nembutal [sodium ethyl-(1 methyl-butyl)—barbiturate]; and pernocton (sodium salt of secondary butyl-β-brom allyl barbituric acid). They are all quickly acting drugs and very toxic, but nembutal and pernocton are twice as toxic, and therefore twice as powerful, as sodium amytal. The latter must be administered in larger doses and the recovery period is therefore longer. Nembutal and pernocton are said to be equal in toxicity, and I think that is borne out by their recovery periods, which are approximately equal.

Pernocton is supplied ready for injection in 10 per cent. solution which saves time, but in my experience it is neither so easy to use nor so pleasant for the patient as nembutal. I have only given it intravenously and the small bulk makes the dose difficult to judge—several of the cases vomited during both administration and recovery periods, and in several, excitement was present during both periods. With nembutal, I have seen practically no ill effects, apart from occasional cases of excitement, during recovery. This occurs in a small proportion of adults and is seldom extreme, but it is much commoner with children, especially when administered by mouth.

Whenever possible it is preferable to give the barbiturates intravenously. They may, however, be administered intramuscularly, or by the mouth or

rectum. By these routes their action is delayed and the correct dose is more difficult to judge. Intravenous administration is easy and the minimal effective dose—just enough to produce unconsciousness, and no more—which is desirable, can be gauged with accuracy.

Amytal powder is supplied in 1.0 gm. quantities and nembutal in 0.5 gm. quantities, sterilized in ampoules. Immediately before use solutions are prepared by dissolving the powder in 10 c.c. of sterilized distilled water. Amytal is therefore administered in 10 per cent. and nembutal in 5 per cent. solution. Pernocton, which is more stable, is supplied in 10 per cent. solution in ampoules containing 5 c.c. The solution is run into the vein very slowly (1 c.c. per minute); meanwhile the patient is engaged in conversation. As the injection proceeds his speech becomes more and more slurred, until finally he fails to answer questions, and sinks into a deep sleep. The administration is stopped immediately he loses consciousness. In this way correct dosage is ensured.

If a small dose of morphine and hyoscine be given beforehand, the intravenous injection is often not remembered at all. Usually very little anæsthetic is needed, although patients vary considerably in this respect; but even after ether, vomiting is practically unknown. Recovery, as a rule, takes place in from two to six hours, followed by the protracted period of drowsiness already mentioned, which may last as long as twenty-four hours.

I have no deaths or mishaps to record with the barbiturates. The only case in which they were blamed (I feel sure unjustly) for subsequent events was this:

A girl of 16, apparently healthy, but with a history that she had had several faints and that her fingers often went blue, had an operation for appendicitis. She was given atropine gr. ⅛; and 5 c.c. of a 5 per cent. solution of nembutal intravenously before operation. No morphine. The anæsthetic was open ether. The operation period was normal and uneventful. While the dressings were being applied, and some minutes after the ether administration had ceased, she quite suddenly stopped breathing and her pulse became impalpable. It was only after the most energetic restorative measures that she started to breathe and her pulse returned. Subsequently she had about forty convulsive fits, probably the result of failure of her cerebral circulation. She did not regain full consciousness for two days, but she finally recovered completely.

I have no idea what caused this patient's collapse—her pulse was good and she behaved in a perfectly normal manner before and during the operation; but I feel sure that, whatever the cause, it cannot be justly attributed to the nembutal she had had.

CONCLUSIONS

I must confess a personal preference for either paraldehyde or nembutal. For children I like the former because the barbiturates must generally be given to them by mouth or rectum; and thus administered they so often cause restlessness. For adults nembutal gives equally good results and is less worrying to the patient than paraldehyde. Post-operative restlessness when present is usually slight, and may be controlled by morphine or rectal paraldehyde. I think that both paraldehyde and nembutal are eminently safe in expert hands.

Combinations of drugs act more powerfully, and smaller doses are needed than of any one drug alone. Elimination is easier and quicker than saturation with one. A little morphine, just sufficient nembutal or paraldehyde to produce sleep, and then nitrous oxide and oxygen or ethylene, with a minimum of ether if necessary to produce relaxation, give the patient most protection, least injury, and an easy awakening.

Basal narcosis marks a distinct advance in the administration of anæsthetics. The advantages of minimized mental shock are sufficiently great in themselves to warrant its use; but since, in addition, it enables us to ensure for our patients absence of vomiting and a post-operative period of unconsciousness,

during which most of the anæsthetic is eliminated, and a great deal of pain evaded, its use is doubly justified. The public are beginning to recognize its merits, and I feel sure that before long the demand for it will be general.

A certain amount of experience is necessary before one can hope to obtain consistently good results. The administration of an anæsthetic becomes a very different procedure from the older methods we have been accustomed to; and it will be regrettable if reproach is brought upon basal narcosis by the inexpert.

Reviews

A GUIDE TO HUMAN PARASITOLOGY.—By D. B. Blacklock, M.D. (Edin.), D.P.H. (Lond.), D.T.M. (Liverpool), and T. Southwell, D.Sc., Ph.D., A.R.C.Sc., F.Z.S., F.R.S. (Edin.). London: H. K. Lewis and Co., Ltd., 1931. Pp. viii plus 271, with 2 coloured plates and 122 illustrations in the text. Price, 15s. net

THIS book, according to the preface, is intended by the authors for practitioners who from time to time will certainly be required to make a diagnosis in diseases caused by animal parasites. It is also intended for those who are taking courses of instruction for the Diplomas of Tropical Medicine, Tropical Hygiene, and Public Health.

The book commences with a brief account of technique, a feature of which is the description of methods of making measurements under the microscope; the making and staining of thick and thin films, and the technique of examining fæces for *E. histolytica*, etc., are also dealt with. This is followed by an account of pathogenic forms among the Spirochæta and Protozoa. A brief account is given of all the species known as occurring in man up to date, information regarding their correct names and the most recent ideas in regard to their morphology and life history being clearly given. *Entamoeba histolytica* and other intestinal forms are specially dealt with and very clearly and excellently illustrated. The different trypanosomes including *T. gambiense* and *T. rhodesiense* are set out in a convenient form for reference as also *T. cruzi*, and the parasites of kala-azar, tropical sore and espundia, etc. A brief account is given of *Giardia intestinalis* and mention of other intestinal flagellates, none of which are considered pathogenic to man. The malaria parasites are dealt with in a short chapter, and the section ends with a brief account of *Balantidium (Ciliata)*.

The section on helminths is beautifully illustrated with clear figures and gives a complete brief synopsis of the facts regarding these important parasites in man. There is a chapter on the technique of examinations and one giving an illustrated key to enable the practitioner to identify the various genera and species. Then follow chapters giving a short account of each species of *Tania*, *Hymenolepis* and other cestodes, several chapters on the trematodes describing the species found in man with brief notes on their habitat, appearance, morphology and diagnosis. The nematodes are similarly dealt with in three chapters. Keys are given to intestinal forms and for the larvæ of filaria-like forms. The facts regarding every species are clearly set out as with the trematodes.

Towards the end of the book there are tables and short sections giving various kinds of information, such as the habitat, distribution, etc., of parasites, a list of apparatus, a list of larger textbooks, and a section on treatment in which are given the drugs used against human parasites, their doses and brief notes about methods of treatment.

The book should be very helpful in enabling the reader to obtain in a bird's-eye view of what the various known parasites of man are up to date. Further than this it should be very valuable for reference to those who are not provided with a complete literature on

protozoology and helminthology and the knowledge to use this appropriately. If the book has a fault it is that it sometimes appears to be almost too condensed, this however is clearly a defect of its qualities. The authors appear to have fulfilled very adequately the objects that are mentioned at the beginning of this review and it is certainly a book every practitioner should have.

S. R. C.

PRACTICAL METHODS IN THE DIAGNOSIS AND TREATMENT OF VENEREAL DISEASES.—By David Lees, D.S.O., M.A., M.B., D.P.H., F.R.C.S., M.R.C.P. (E). Second Edition. Edinburgh: E. & S. Livingstone, 1931. Pp. 634 plus xx, with 87 figures and 8 coloured plates. Price, Rs. 11-4. Obtainable from Butterworth and Co. (India), Ltd., Calcutta

THIS work is everything a textbook should be, a record of personal experience by an expert in the diagnosis and treatment of the diseases in question. It is expressed with the clearness and vigour which those who, like the reviewer, have had the pleasure of hearing Mr. Lees lecture would expect to find in his written work.

Where all is so good it is difficult to select any particular points for special mention, but we may refer to the wealth of practical detail which is so useful to the practitioner, e.g., as to exactly how and where to give the various injections recommended. A chapter is devoted to exact direction as regards courses of treatment, though the author specifically states that the individual patient must be studied and the treatment modified in certain cases. The treatment of inherited syphilis and of syphilis during pregnancy receive special notice. About half of the work is devoted to syphilis. One chapter on chancroid, phagedæna and inguinal bubo then follows, the remainder being occupied by the subject of gonorrhœa in both sexes. One of the most valuable parts of the work is the last chapter containing the pharmacopœia. As regards the use of bismuth Mr. Lees' opinion is that it is 'not so potent a spirochæticide as the salvarsan preparations, but it is probably more potent than mercury, and is in many cases better tolerated than either salvarsan or mercury'. He adds that 'undoubtedly there is still a place for mercury in the treatment of syphilis'.

Those who are not specialists in the subject will appreciate from this absolutely up-to-date work the enormous improvements in treatment which have been introduced of late years. While giving full credit for these improvements, fundamental changes in the treatment of the venereal diseases are very much overdue. We know that if syphilitic patients will do all that an expert directs them to do they will in a very large proportion of cases be cured. But what does it involve? We cannot be said to have entirely solved the problem of the treatment of syphilis if we cannot effect a cure in less than two years and in chronic gonorrhœa the prolonged manipulations are an equally unfortunate necessity of present day treatment.

The work contains many excellent illustrations, all except one being from the author's own cases.

In cases of syphilis of the nervous system in which treatment by induced malaria is decided upon, Mr. Lees's technique is to obtain 3 to 5 c.cm. of blood from an inoculated case of benign tertian malaria during an attack of fever and to inject this after citration either subcutaneously or intravenously into the patient. The intravenous route is preferred as the incubation period is shorter and the results more certain. The onset of rigor may be accelerated by an intramuscular injection of adrenalin chloride. Patients are usually allowed to have from ten to twelve febrile attacks and no attempt is made to control the pyrexia unless it exceeds 105°F. After this treatment plasmoquin is administered. Treatment of these cases by trypanamide is regarded, however, as the method of choice.

If we may make one criticism, we think it is time some effort was made to express dosage according to one system, *e.g.*, in the table on page 303 detailing a combined course of treatment consisting of try-paramide and bismuth or mercury we find the dosage of the first two expressed in grammes and that of the third expressed in grains, surely not a very satisfactory method, and if the practitioner by mistake read the dose of mercury as grammes he would have cause to regret it. We know that this raises a large question, but the difficulty would be in a measure avoided were the dose of the mercury stated in grains with the gramme dose in brackets, or *vice versa*.

Mr. Lees have given us a textbook which is probably the best work in the English language on the subject.

R. B. L.

MEDICAL EMERGENCIES.—By Charles Newman, M.D. (Cantab.), M.R.C.P. (Lond.). London: J. & A. Churchill, 1931. Pp. ix plus 128. Price, 8s. 6d. net

It was certain that the success attained by 'Surgical Emergencies', in Churchill's Empire series would necessitate a volume on those emergencies of practice which come under the care of the physician rather than the surgeon.

Dr. Newman has not the same scope as his surgical confrère and in consequence his book is smaller, but he has covered the ground completely. The first chapter, and perhaps it is the most important, describes the symptoms and treatment of the various forms of poisoning. It is concise and dogmatic, and the practitioner will find here all that he can and should do when he first sees a case of this kind.

A chapter on the treatment of the different forms of coma and convulsions follows, and there is then one on circulatory failure. Hæmorrhage, in so far as it can be treated medically, is considered, and the greater part of this chapter deals with hæmoptysis and hæmatemesis. Asphyxia, diphtheria, tracheotomy and many other emergencies find their place in this book, while such procedures as blood transfusion and lumbar puncture are not forgotten.

There can be no doubt that this little book will be as popular and as valuable as its surgical companion.

H. H.

AN INTRODUCTION TO NEUROLOGY.—By C. Judson Herrick. Fifth Edition, thoroughly revised. London and Philadelphia: W. B. Saunders Company, 1931. Pp. 417, with 138 illustrations. Price, 12s. 6d. net

THIS book, written by the Professor of Neurology in the University of Chicago, has now reached its fifth edition. Its object is to help us to understand the actual operation of the nervous mechanisms of the central nervous system and to explain the complex inter-connections of the various nerve centres, a knowledge of which is so necessary for the intelligent treatment of nervous diseases.

The book deals chiefly with the architecture or morphology of the central nervous system—the localisation of the nerve cells with a particular function, and a discussion of the more important functional systems.

Special features of this book are the very extensive general index at the end of the book, which includes a glossary of commonly-used technical terms, and the bibliographies appended to the various chapters. Each chapter ends with a useful summary of its contents.

This is a book which can be recommended to advanced students of physiology and particularly to those making a special study of neurology, psychology and psychiatry.

A. C. MacG.

RHEUMATOID ARTHRITIS AND ITS TREATMENT.—By V. Coates, M.C., M.A., M.D. (Cantab.), M.R.C.P. (Lond.), and Leo Delicate, L.M.S.S.A. (Lond.). London: H. K. Lewis and Co., Ltd., 1931. Pp. xiv plus 114, with 12 illustrations. Price, 6s. net.

THE principles laid down in this small book are the outcome of experience gained in the treatment of a vast number of patients in the Royal Mineral Water Hospital at Bath. The author, avoiding discussions on the ætiology of diseases of the arthritis group, opens with a brief clinical picture of what he terms rheumatoid arthritis. He gives reasons for retaining this name which now tends to disappear from literature and makes clear the class of case to which it is applied. Stress is laid on the concomitant symptoms, especially the muscular wasting to which due attention must be paid in treatment.

For statistical purposes one hundred consecutive cases have been taken and certain points of extreme interest come to light, as for example, that 20 per cent. showed enlargement of the thyroid, and that in 6 per cent. subcutaneous nodules—identical with those of true rheumatism—were found. Biochemical investigation revealed no constant phenomena other than an alteration in the sedimentation rate, though some degree of anæmia was common and the gastric hydrochloric acid was absent in 22 per cent.

The section on treatment is stimulating in showing how much can and should be done, and in offering certain definite lines on which treatment should be based. The case for institutional treatment is supported by an explanation of the rationale and value of baths and massage. An important matter, too often neglected, namely the treatment of individual joints during the acute stage and later, when deformity has set in, is discussed in detail.

Little mention is made of drug treatment save in the correction of metabolic errors; and as regards diet, the author states that it is not possible to lay down a standard, but that it should be prescribed with a full appreciation of any metabolic errors present.

E. H. V. H.

THE THYROID AND MANGANESE TREATMENT.—By H. W. Nott, M.R.C.S., L.R.C.P. London: William Heinemann (Medical Books), Ltd., 1931. Pp. xv plus 265. Price, 7s. 6d. net

Dr. Nott's papers, the first of which appeared in the *British Medical Journal* of 1925, attracted considerable attention. The author of these papers had a difficult task before him in that he advocated a simple line of treatment which had, in his hands, proved successful in an unexpectedly divergent variety of cases. The treatment consists of the combination of two therapeutic agents, thyroid and manganese, both of proved value in infective conditions, with or without the contributing benefit of a rectal washout.

So far the matter is simple and it is not difficult to see that such treatment may be of real value in a number of cases, particularly in chronic infections with or without arthritis. The author, however, applied the treatment to a wide variety of cases and reported startling successes in the treatment of diseases as far apart as pneumonia, hyperpiesis, diabetes, and arthritis. He anticipated, not without reason, that the profession as a whole would be sceptical of such wide claims and, in order to add weight to his contentions, he enlisted the assistance of other observers, whose results, as well as his own, were embodied in his reports.

In the present book the author amplifies his previous contributions to medical journals (which are here reprinted in the form of an appendix) and describes in detail his experiences from the inception of this line of treatment, together with a full discussion on the possible modes of action.

It is difficult to estimate what position this treatment holds in the minds of the medical profession at the present time; the treatment has been extensively tried; many observers, as reported by the author, are

enthusiastic, but from other sources the evidence is conflicting. Undoubtedly in certain cases of hyperpiesia, and in infective and other conditions the treatment has met with success, but many of the cases are such that would have benefited by thyroid alone.

Dr. Nott has presented his case in a convincing manner, supporting his own evidence by that of others. There is little doubt that this line of therapeutics, possibly with the limits of its scope more accurately defined, will occupy a permanent place in medicine, and that this work will encourage a further investigation of its potentialities.

E. H. V. H.

POSTURE: ITS RELATION TO HEALTH.—By Frank D. Dickson, M.D. London: J. B. Lippincott Company, 1931. Pp. xi plus 213, with 118 illustrations. Price, 21s. net. Obtainable from Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 15-12

THIS book is one of the 'Everyday Practice Series'. It is a small volume dealing with visceroptosis and many other deformities. There is not more in it than is found in the average textbook of surgery. The treatment recommended for scoliosis is somewhat drastic; the author relies on spinal fixation. Insulin in small doses is well spoken of as a means of increasing weight in the carnivorous type. No mention is made of gonorrhoea and rheumatoid arthritis as causes of flat foot.

The book contains 118 illustrations many of which are good; many others are rendered almost unintelligible by the scrupulous decorum with which the figures are clothed.

There are a number of printer's errors, such as 'plan' for 'play' on page 57. The outer border of the foot in flat foot is described as 'convex' on page 152, instead of 'concave' as on figure 70, page 151. It is unusual—at least in Great Britain to see 'insofar' printed as one word.

The book is artistically bound, and the print is clear and easy to read.

S. A. McS.

MEDICINE: ANALYTICAL REVIEWS OF GENERAL MEDICINE, NEUROLOGY, PÆDIATRICS. Vol. IX, No. 3, September 1930. Baltimore, U. S. A.: The Williams & Wilkins Co. Pp. 500 to the Volume. Price, 21s. per volume, Postage 2s. 6d. net. Single copy 6s. 9d. net. English Agents: Baillière, Tindall and Cox, London.

THE number of *Medicine* under review is no exception in this excellent series, of which we have already had the pleasure of reviewing several copies, and on which we have always commented favourably. The first article on 'Observations on the courses of different types of Bright's disease, and on the resultant changes in renal anatomy' embodies the labours of a set of prominent workers under the guidance of the distinguished bio-chemist, Dr. van Slyke, and is a masterly survey of the whole problem of Bright's disease. Both to the pathologist and the bed-side clinician, the article will be of great help, as the laboratory and clinical picture of nearly 66 typical cases together with their autopsy reports with special reference to the macroscopic and microscopic appearances of the kidneys, have been recorded.

The second article is a reproduction of the lecture delivered by Dr. Olitsky before the Johns Hopkins University School of Hygiene and Public Health. An admirable account of recent research and investigations in the field of the bacteriology of epidemic influenza is given. According to the author, along with Pfeiffer's bacillus and the organism of common cold—the organisms commonly believed to be responsible for epidemic influenza—the part played by *Bacterium pneumosintes* and allied micro-organisms should not be lost sight of. Although the question of the precise agent causing epidemic influenza cannot at the present time be definitely answered, the author is optimistic

that recent researches will be able to solve the problem in the near future.

R. N. C.

STUDIES OF BRIGHT'S DISEASE.—By D. D. van Slyke, et al. (Medicine Monograph, Vol. XVIII). London: Baillière, Tindall and Cox, 1930. Pp. 130 with 4 plates and 37 figures in the text. Price, 13s. 6d. net

THE article on Bright's disease referred to in the above review has been published as a separate volume, volume XVIII of *Medicine Monographs*.

It is a neat, well-bound volume, and the more fastidious amongst medical men will consider the extra cost of the book in this form as money well spent.

PHYLAXIS.—By the late G. Billard, M.D. Translated by H. Galnsborough, M.D., F.R.C.P. London: Kegan Trench Trubner and Co., Ltd., 1931. Pp. xlii plus 77. Price, 9s. net

IN this little book Professor Billard has presented his conception of the method of protection afforded by the use of agents such as opartetine, mineral waters, chloroform, Gardenal and others against various forms of poisons, such as viper venom, diphtheria, and tetanus toxins. To this new method of protection he has applied the term 'phylaxis' and has shown that it is different from immunity because the phylactic agents do not act by neutralizing the toxins through the agency of the humoral or cellular mechanism of defence. His researches further show that in phylaxis the protection afforded is not the result of neutralization of the toxins due to the chemical nature or physical state of the substances used. Professor Billard explains phylaxis by the hypothesis that the agents used cause artificial impermeability of the cells to toxins, i.e., the phylactic substances have a greater affinity for the tissues on which the toxins act and when introduced either before or with the toxin they are able to reach the cells first and fix themselves to them and then prevent the toxins entering and damaging the cells.

This conception of phylaxis is not a mere invention of Professor Billard's fertile imagination, but is based on a series of sound experimental researches which are very well presented in the book and which deserve a careful study. It is, therefore, strongly recommended that his book be read by everyone interested in the study of immunity.

K. V. K.

OPERATIVE DENTAL SURGERY.—By J. B. Parfitt, L.R.C.P., M.R.C.S., L.D.S. Third Edition. London: Edward Arnold and Co., 1931. Pp. vii plus 405. Illustrated. Price, 21s. net

IN this, the third, edition published in May, 1931, much has been re-written. There are a number of omissions and additions, which bring the book up to date. The title is somewhat misleading, as the book does not, as one might infer, cover the whole field of operations at the chair side, there being no mention of the treatment of pyorrhoea alveolaris and diseases of the soft tissues.

Otherwise we may say at once that we consider it an excellent book for both students and practitioners, particularly those of medicine, in India, who take a keen interest in and would prefer to practice dentistry. Every stage of each operation is described in a most practical and lucid manner and the book is full of useful 'tips' and 'aids'. There is a very good chapter on the treatment of the teeth of children, a branch of dentistry in which, in India in particular, there are splendid openings for the keen, able and sympathetic practitioner.

The book is well produced on good paper with numerous instructive illustrations and is moderately priced at a guinea.

J. E. G.

AIDS TO PHYSIOLOGY.—By H. Dyerre, Ph.D., M.R.C.S., L.R.C.P. (Lond.), F.R.S.E. London: Baillière, Tindall and Cox, 1931. Pp. vii plus 255, with 57 figures in the text. Price, 3s. 6d. net

Aids to Physiology forms one of the Students' Aid Series. The object of this book, as stated in the preface, is to give the student a survey of the scope of physiology so that he can more profitably utilise the larger textbooks. Students are frequently bewildered by the vastness of the details in ordinary textbooks of physiology. Especially is this the case in chapters dealing with the nervous system. Used thus, as an introduction to the study of physiology, it is a book to be recommended.

The subject matter is brought up to date and much information is given in little space. The whole field of physiology is surveyed with the exception of 'reproduction' which for some reason is omitted altogether. Two useful tables are given, one on 'vitamines' showing their source and properties, and the other on 'the chief enzymes taking part in digestion'.

A. C. MACG.

MANUAL OF HUMAN PHYSIOLOGY.—By Sir Leonard Hill, M.B., LL.D., F.R.S., Hon. A.R.I.A. Third Edition. Published by Edward Arnold & Co., London, 1931. Illustrated. Pp. 464. Price, 6s. 6d.

THE book is designed for the use of the general reader. As accurate an idea of the subject as is practicable within its limited compass has been given to the reader in a clear and concise manner. An exceedingly complex subject, involving an understanding of the structure and functions of the human body with its various organs, requires not only a practical knowledge of the underlying principles of the subject, but also an elementary knowledge of physics, chemistry and anatomy, and the author has done well to include throughout the book a large number of practical experiments that will lead to a better understanding of the subject. For instance, when dealing with the subject of the mechanism of movement, the author has also illustrated its physical aspect, giving information on such subjects as the principle of the lever, the centre of gravity, inertia, friction, etc., and has given examples of the various levers in the body in their scientific order. Similarly, there are lessons in the book dealing with simple chemical experiments, and dissection of the lower animals, such as rabbits, which will greatly help the reader to grasp the subject more scientifically. Technical terms have been avoided as far as possible.

We are of opinion that the book will prove very useful to those for whom it is intended.

J. P. B.

ULTRA-VIOLET THERAPY.—By A. Furniss, L.R.C.P., L.R.C.S. (Edin.), L.D.S., D.P.H. London: William Heinemann (Medical Books), Ltd., 1931. Pp. xii plus 365. Illustrated. Price, 12s. 6d. net

THIS book is an excellent and fairly comprehensive review of the subject of light therapy. Physical principles are well set out. The author has wisely stressed the point that ultra-violet radiation, though a specific in rachitic conditions, is in the vast majority of cases a very valuable adjuvant treatment only. Other forms of physio-therapy, such as infra-red radiation and diathermy, are included. Dentists will be grateful for a valuable chapter on the uses of ultra-violet light in diseases of the teeth and gums.

This is, so far as we are aware, the best book in English that has appeared on this subject. Students and general practitioners will find it full of useful information and the specialist in radiology will have a very welcome addition to his bookshelves.

G. G.

AN INTRODUCTION TO HYGIENE.—By W. Robertson, M.D., D.P.H., F.R.C.P. (E). Edinburgh: E. & S. Livingstone, 1931. Pp. 207. Illustrated. Price, Rs. 4-8. Obtainable from Butterworth and Co. (India), Ltd., Calcutta.

THE author's reputation as an administrator, teacher, and author led us to expect something better than this. The information is elementary and in many

cases meagre, and mostly uninspiring. The author might have spared us the misprint of *sulphides* for *sulphates* in describing the causes of hardness.

The illustrations are good and the book will be found perhaps useful by medical students, purely for examination purposes; but it does not breathe the spirit of modern hygiene.

A. D. S.

HANDBOOK OF SANITARY LAW FOR THE USE OF CANDIDATES FOR PUBLIC HEALTH QUALIFICATIONS.—By B. Burnett Ham, M.D., D.P.H. (Camb.). Eleventh Edition. London: H. K. Lewis and Co., Ltd., 1931. Pp. xxxi plus 366. Price, 7s. 6d. net

THIS continues in our opinion to be the most useful handbook on English Sanitary Law for students' use, and for ready reference. The arrangement is both logical and chronological. We know of no other book quite as good. The new matter added in this edition is the Local Government Act of 1929, the Mental Treatment Act of 1930, the Tuberculosis Order and Regulations of 1930, and the Housing Act of 1930. The Local Government Act of 1929 probably constitutes one of the greatest advances in public health administration of recent times; this aspect is hardly emphasised enough in the book. The Housing Act is fully dealt with.

The form, printing, and size are the same, and constitute additional attractions.

Every student of public health should have a copy of this new edition.

A. D. S.

CONFERENCE ON THE LIMITATION OF THE MANUFACTURE OF NARCOTIC DRUGS. Information Section, League of Nations Secretariat, Geneva, 1931. Pp. 27.

THIS is a small brochure of 27 pages containing an account of the activities of the League of Nations in the question of the limitation of the manufacture of narcotic drugs. A conference of the representatives of different nations was convened at Geneva in May, 1931, to discuss the problem of suppressing the illicit traffic in narcotic drugs and to formulate, if possible, a practicable scheme whereby the manufacture of these drugs might be limited to the medical and scientific needs of the world. A number of proposals and schemes were submitted and discussed. The system of allocation of quotas between the manufacturing countries was put forward as a possible solution, but objections were raised as to the quantity to be allocated to each country and regarding the central authority to determine the estimates of the requirements of different countries. The problem seems to be full of complexities and though the different countries are all agreed to the principle of the 'limitation scheme' and the need for co-operative action, there is no unanimity of opinion as to the line of action to be finally adopted.

R. N. C.

THE SNAKE POISON AND VARIOUS OTHER POISONS HOW TREATED.—By P. Rama Kurup, B.A., L.T. Trichur: The Mangalodayam Press, 1931. Pp. x plus 133. Price, Re. 1

THIS little book deals with both snakes and other venomous animals, but the major portion is devoted to the description of snakes only. The book is an extract from 'Jytsnika' written in Malayalam. In the preface the author refers to many other books written in Sanskrit and other oriental languages, and he is anxious to bring before the English reading public the secret remedies used in India since old times. The details he gives regarding the procurement, the life history and the poisons of snakes are very interesting, and are based mainly on the Indian mythology which does not agree with the modern theories of physiology and clinical medicine. The author classifies the snakes into four divisions of Brahmins, Kshatryas, Vysyas and Sudras, depending upon their appearance, mode of life, habits, etc. The toxicity and prognosis are based upon

the theory of humours. A good number of prescriptions are added for each poison, but the whole treatment is linked with the zodiacal position of stars and the omens in connection with the messenger and the healer. The author has done well to give botanical synonyms for most of the drugs used in the prescriptions. The book is written by a non-medical man and can only be recommended to those interested in the Ayurvedic system of treatment, there being little in it for the present-day physician.

R. N. C.

PRESIDENCY GENERAL HOSPITAL PHARMACOPŒIA AND DIET SCALES, 1930. Published by the Bengal Secretariat Book Depot, Calcutta, 1931. Pp. 161. Price, Re. 1

A PHARMACOPŒIA is a necessity in every large hospital and medical institution, as it not only serves as a guide to the medical staff but also helps largely in the working of the attached dispensary. The appearance of the new *Presidency General Hospital Pharmacopœia* will therefore remove a long-felt want of the members of the institution. A pharmacopœia is a book of standards; the editor is more or less bound down by formulæ and recipes of old standing and cannot allow himself to be carried away by therapeutic nihilism and modernization. His task, therefore, involves a great deal of judgment and discretion and he deserves credit in being able to bring forth a harmonious blend of the new and the old. The new formulæ introduced will be appreciated by all modern physicians as they have already been placed on a sound and rational footing, e.g., mist. preoperativa, pulvis Maclean for intensive alkaline treatment, tannic acid solution for burns, Rogers' alkaline solution for intravenous injection, solution sodii citras for blood transfusion, solution sodii bromide for pyelography, etc. It is difficult to understand why in a recent pharmacopœia a cinchona febrifuge mixture has not been included in view of its wide recognition in India as a valuable anti-malarial remedy. The popular formulæ likely to be missed are a silver nitrate lotion, a cocaine lotion for the eye, and an alkaline lotion for the nose. Apart from the section on formulæ there are several other sections replete with most useful information. The notes on poisons and their antidotes, analysis of urine, methods of staining, tests for diseases of metabolism, digitalisation and the posological table, and the tables showing the caloric values of common foodstuffs in India are well worth careful study and will be of immense assistance to all junior members of the profession. It may be said without exaggeration that the handbook marks a step in advance of several other pharmacopœias on the market.

R. N. C.

CATALOGUE OF INDIAN INSECTS. PART 19—GYRINOIDEA.—By George Ochs. Calcutta: Government of India Central Publication Branch, 1930. Pp. 37. Price, As. 12

ONE HUNDRED AND TWENTY-ONE forms belonging to five genera are listed in this catalogue, with references and records of the localities in which they have been taken. The family is widely distributed in the East and is found, sometimes in large numbers, in both standing and running water. It is of considerable economic importance as the species are chiefly predaceous on aquatic larvæ, particularly those of the Culicidæ and Chironomidæ. In fact Pruthi, in a note (*Indian Journ. Med. Res.*, XVI, p. 155) which has been overlooked in the catalogue, describes a species of *Dineutes* and *Orectochilus gangeticus* as 'deadly enemies of mosquito larvæ'. Pruthi states further that 'Considering the large numbers in which Gyrinid beetles occur in ponds, etc., there is no doubt that any *Anopheles* has but little chance of surviving in any area of water inhabited by these beetles'. It is therefore to be hoped that Dr. Ochs' catalogue will encourage further work on these beetles. The care

with which it has been compiled should certainly facilitate this.

C. D.

CATALOGUE OF INDIAN INSECTS. Part 20.—Alucitidæ by T. Bainbrigge Fletcher. Price, Re. 1-6. Part 21.—Lycidæ by Richard Kleine. Price, Re. 1-2. Part 22.—Phalonidæ and Chlidanotidæ by T. Bainbrigge Fletcher. Price, As. 6. Calcutta Government of India Central Publication Branch. 1931

THESE works continue the systematic cataloguing of the Indian insects and have the same scope as those already issued, i.e., the families are classified into genera and species, the synonyms of each group and the distribution of each species being given.

The Alucitidæ are allied to the Pyralidæ, the cabbage-caterpillar family, and as such their orbits possibly sometimes meet that of Man; otherwise, they are of no medical interest.

C. S.

DO MYCETOMA PEDIS NO BRAZIL.—By Dr. Eduardo Luis Ferreira de Araujo. *Officinas Da Livraria Das Americas. Praca da Inglaterra Bahia. 1930.* Pp. xviii plus 300. Illustrated

THE author has described 59 cases of mycetoma of the foot, the condition known clinically as Madura foot, which he has seen in Brazil. The monograph gives a complete study of microscopical appearances seen in the tissues, as well as a morphological study of these fungi. The pathogenic aspect of this lesion is discussed in detail from the aspect of diagnosis, epidemiology and its parasitology. The different species of fungi which have been found by the author causing mycetoma have been identified by him as *Actinomyces bovis*, *A. maduræ*, *A. braziliensis*, *A. bahiensis*, as well as *Madurella oswaldi*, *M. ramiroii*, *Indella Brumpti* and *Scedosporium apiospermum*, etc.

H. W. A.

HEALTH IN HOT CLIMATES.—By J. N. Dugdale, M.B., Ch.B. (Edin.). Second Edition. London: John Bale, Sons and Danielsson, Ltd., 1931. Pp. 189. Price, 5s. net

THIS admirable little book has now passed into a second edition. The author has had tropical experience in Western and Southern Asia, Central China, and Northern Africa. The object of the book is not in any way to replace medical aid, but to give some idea to the anxious relative or friend of what he can do before medical assistance arrives. The chief aim of the book, however, is to help those who live in hot climates to understand the single principle of how to avoid disease.

The book is simply and briefly written, it covers a very wide variety of subjects, and is exactly the thing to put into the hands of the layman going out to the tropics for the first time. The short chapter on the vitamins is a good example of how to give accurate information briefly and succinctly, but in a readily-understandable manner. The subjects dealt with include a chapter on how to save life, the care of eyes, ears and feet, intestinal complaints, malaria and blackwater fever, and the commoner tropical diseases. A very good section deals with 'nerves' and neurasthenia in the tropics. Even the importance of hobbies is stressed.

We are glad to see that the book retains its well-deserved popularity.

R. K.

A PRACTICAL GUIDE TO THE EDINBURGH F.R.C.S.—By Mary Keith-Thompson, M.A., M.B. (Cal.), F.R.C.S. (Edin.), D.T.M. & H. (Eng.), L.M. (Dub.). Calcutta and Simla: Thacker, Spink and Co., Ltd., in Liquidation, 1931. Pp. iv plus 29. Price, Rs. 2

THIS booklet should be of considerable value to the Indian doctor who wishes to pass the Edinburgh

fellowship examination. Every detail of information required is gathered together within 29 small pages. Such matters as the time and money required, where to read, and which classes to attend are discussed in a minimum of space. As a popular guide book to those concerned it can be strongly recommended.

E. M.

Annual Reports

ANNUAL REPORT OF THE EXECUTIVE HEALTH OFFICER, BOMBAY FOR THE YEAR 1930. BOMBAY: THE TIMES OF INDIA PRESS. 1931

THE city of Bombay occupies an area of 23½ square miles; its population in 1921 was 1,175,914. The estimated population at the mid-year of 1930 was 1,298,708; calculated on the basis of the increase between 1911 and 1921 being arithmetical and on the assumption that the increase in that decade has continued at the same rate after 1921.

It is interesting to note that the actual census of 1931 did not bear out the above assumption; it was actually less than the 1921 census. The calculated birth and death rate from 1921 onwards would require modification; for 1930 they would be actually higher than the one given in the report.

The birth rate on the calculated population in 1930 was 19.5; the death rate 21.2.

The infantile mortality recorded is 296 per 1,000 births. The composition of Bombay is peculiar in that males form two-thirds of the population. The above rates are therefore not comparable with other Indian towns or with the country in general without some form of standardisation. There were 40 deaths from cholera during 1930, 29 from plague, 1,677 from small-pox, and 1,450 from tuberculosis.

Respiratory diseases head the list easily as causes of death. Congenital debility and early infancy deaths come next, while malaria, ague and remittent fever are high up. Infantile mortality rates, though high, show a definite decrease during the last few years, but here again some form of standardisation would appear necessary.

Work in the prevention of infantile mortality is definitely organised. Municipal district nurses, midwives, provisions for lying-in women, maternity homes, infant-welfare centres and milk depots constitute the main provisions made by the corporation. The work seems now on a very firm foundation and voluntary welfare centres do good work.

The fact is again noted that the number of infant deaths to births varies inversely as the number of rooms occupied by the parents.

Epidemic diseases.—Plague accounted for only 29 deaths. Rat destruction is still vigorously carried out. Six lakhs were collected and destroyed; of the rats examined 0.25 per 100 were found infected with plague. Smallpox was epidemic for part of the year. Of 449 infants who died of the disease, 400 were unvaccinated.

Cholera caused only 40 deaths in the year.

Tuberculosis is a serious disease and caused 1.1 deaths per 1,000. The highest age incidence is between 15 and 30. There are two 'dispensaries' and the Turner Sanatorium for preventive work. These work on approved up-to-date lines and interesting work on clinical cases is described.

Malaria.—One turns to this section with interest in view of Covell's recent report and some recent correspondence in the medical press on the subject. A note gives the amount of work done in connection with important breeding places of mosquitoes after the publication of Major Covell's report. Wells, cisterns, tanks, reservoirs, gardens, and farms have all received attention, but no mention is made of co-operation between Port Commissioners, railway, and military authorities which Covell stressed as being so important. The spleen rate for the whole city is 12.2, by no

means negligible. Some of the wards show rates of 38. The rates generally are said to be falling since Covell's report.

Veneral diseases.—A clinic is run on modern lines; postgraduate training classes are held; during the year 3,497 cases were dealt with. 'Discontinued treatment' is still a high item in the totals.

The general sanitation of the city progresses. The water supply is above suspicion in quality, no note is made as to the distribution system, which is presumably satisfactory. The policy of converting privies into water closets by giving a subvention of Rs. 75 still continues, and 7,718 privy seats were converted during the year—a good record. Since 1898 the city Improvement Trust has provided 48,520 new tenements, as against 33,188 tenements demolished; 308 new tenements were added in 1930. The appendices have some interesting notes on treatment, etc., in the Maratha and Arthur Road Hospitals. The report bears evidence of a great deal of work conscientiously carried out by the Health Department.

REPORT OF THE MEDICAL OFFICER OF HEALTH, DELHI MUNICIPALITY FOR THE YEAR 1930. DELHI: PRINTED AT THE DELHI MUNICIPALITY PRESS. 1931

DR. SETHNA, who has been Health Officer of Delhi Municipality for the last twelve years, is essentially a practical sanitarian. Much has been done in the matter of improved methods of filtration and purification of water, provision of drains, provisions of water-borne latrines, construction of markets, cleanliness, etc. Dr. Sethna has managed to get much done by his energy, resourcefulness, and push, and by plain speaking. Much remains to be done, however, particularly in the matter of housing improvement, drainage, night-soil removal, removal of night-soil disposal grounds to without the city, the construction of an infectious diseases hospital, the reclamation of the *bela*, etc., etc. Tuberculosis and enteric fever are two important matters. The former is largely a matter of bad housing and overcrowding and Dr. Sethna rebukes the councillors for condoning irregularities and evasions of the building bye-laws and for not enforcing such bye-laws as exist. The bye-laws require amending but the committee do not apparently seem willing to move in this connection. The large amount of enteric fever Dr. Sethna attributes to the proximity of water pipes to drains and sewers. A medical sub-committee of the Municipality agrees with him, but a non-medical committee does not, and appeals to the Hakim and Vyaids Association for their opinion. Experience in Calcutta has shown that water supplies may thus be locally infected and the condition if it exists is so undesirable that it should be rectified at once. Plague was practically absent. An extensive rat-killing campaign was carried out, over 2 lakhs of rats being destroyed. *X. astia* is the most prevalent flea at the present time, forming from 60 to 80 per cent. of the fleas captured. Malaria was not a serious feature during the year, only 9 deaths being attributed to it. General antimalaria measures were carried out, but the covering of wells seems to be resented by many residents, and the Health Officer's recommendations have not been fully carried out. 717 deaths occurred from phthisis, but verification would place the number as high as 1,200. Dr. Sethna holds that phthisis is definitely on the increase. Tuberculosis really is one of the main diseases of city life in India. It is a much more serious factor really than malaria or plague, which though serious are evanescent. Tuberculosis has many deep-seated fundamental causes. Each difficult of improvement and removal.

The population of Delhi in 1931 was 3,47,592, an increase of 1,00,935 over 1921, i.e., an increase of 40½ per cent. It would be interesting to know how this enormous increase has found housing accommodation. The birth rate and death rate for 1930 were 56.67

and 38.06 respectively, the infantile mortality rate being 198.70. The largest number of births takes place in August, September and October, while the highest infantile mortality is in May; the highest crude death rates occur in March, and April. These seasonal facts are of interest.

Delhi remained practically free from cholera despite the fact that it was appreciably present in the neighbouring places. There was a severe epidemic in 1929, however. Those who know Delhi will remember the locations of night-soil disposal grounds not very far from the entrance to New Delhi. They are recognised to be a sanitary evil and they provide the enormous numbers of flies which are found in Delhi at certain seasons. Experiments with motor lorries to remove the night-soil to a safe distance outside the city limits are being tried, but it is not clear why the remedy of putting this night-soil into the combined water carriage system is not done. The system was surely designed with this object. Rs. 13,697 accrued to the municipality from the sale of night-soil, so this is possibly one reason.

Dr. Sethna describes a method of capturing fly pupæ by scraping the surface layers of the disposal ground and putting the scrapings in water. The pupæ float and are removed and burned. The daily collections of pupæ amounted in all to 2,30,280 potential flies.

Maternity and child-welfare work proceeds apace and four new centres were opened during the year. There are now 5 large and 4 small maternity and child-welfare centres in the city. The record of work done is excellent.

The report is very interesting and essentially practical. Dr. Sethna and his staff are to be congratulated on an excellent year's work. The steady reiteration of practical work and advice is beginning to tell.

REPORT ON THE PUBLIC HEALTH ADMINISTRATION OF THE PUNJAB FOR THE YEAR 1929. BY LT-COL. C. A. GILL, D.P.H., I.M.S., DIRECTOR OF PUBLIC HEALTH, PUNJAB. LAHORE: PRINTED BY THE SUPERINTENDENT. GOVERNMENT PRINTING, PUNJAB. PRICE, RS. 3-8

In 1929 the birth rate for the Punjab was 44.45 per 1,000 and the death rate 28.75. The birth rate is the highest of any of the provinces of India, while the death rate was lower than for many years. The resulting excess of births over deaths is 15.70 per 1,000, a natural increase unequalled anywhere in India and only rarely approached in any other part of the world. The year was remarkably free from widespread disease, except for outbreaks of cholera and malaria restricted to certain parts of the province.

In rural areas cholera can be quickly brought under control, but in towns the disease persists for many weeks or even months. The conservancy system of the towns is very unsatisfactory and needs complete overhaul, while there is not a town except Simla which has an infectious diseases hospital.

The outbreak of malaria was interesting. As is well-known, Lt.-Col. Gill and his colleagues have instituted a system of forecasting malarial epidemics in the districts of the Punjab, by considering various contributory factors, such as the July-August rainfall, economic conditions, previous epidemicity, etc. In 1929 the forecast was remarkably accurate. The forecast is made in the beginning of September so that it is quite possible to initiate preventive measures such as distributing quinine in the threatened districts, so that quinine is available in every village. It has not been possible to gauge exactly the effect of this quinine distribution. The increase of the 'fevers' death rate was considered to be totally attributable to epidemic malaria.

Plague is at present at a very low mortality rate in the Punjab and the last three years have shown

a remarkably low incidence. But as Col. Gill points out, this low mortality may only mean a slumbering dog; the mortality was as low in 1899 and 1901 but three years of low mortality were followed by a sudden devastating epidemic which lasted for six years.

Anti-plague measures are therefore being carried on, and consist mainly of rat destruction in towns and villages where plague (rat or human) was known to have been present after the close of the plague season.

Respiratory diseases caused no fewer than 51,877 deaths, a mortality rate of 2.53 per 1,000. In urban towns the cause is undoubtedly mainly tuberculosis, though influenza and relapsing fever are both returned under the heading of respiratory diseases. The problem of pulmonary tuberculosis in Indian towns is pressing and terribly difficult to tackle. It has aspects much deeper than those which public health alone can deal with. The sanitarian can point to some of the more obvious methods of preventing the spread of infection, but nothing short of a revolution in the habits, customs, and mode of living of the people, and a radical improvement in economic and housing conditions can do anything to strike at the roots of the problem.

The report contains some excellent coloured charts illustrating the death and birth rates, and infantile mortality rates from 1867 to 1929. The death rate from cholera (annual and weekly), the death rates from smallpox during the same periods, plague death rates from 1898, fever from 1867, and the spleen rate by districts for 1929 are illustrated.

These admirably complement and illustrate the text matter. There is an interesting section on the development of urban and rural sanitation; good progress is reported in the improvement of water supplies particularly, but these installations are often apparently not appreciated at their full value and their management neglected. Infectious diseases hospitals are urgently required in towns. The village uplift movement initiated by Mr. Brayne, i.e.s., has left its mark in the extending interest taken in the cleanliness of villages. Many village lanes have been paved and sanitary committees and village panchayets are doing much more to bring higher standards of cleanliness to village life.

The educational bureau carries out health propaganda by lectures and demonstrations but Col. Gill believes, and rightly, that the best method of health propaganda is to show what can be done practically during outbreaks of cholera, at village fairs, and at infant-welfare centres.

Excellent work is being done at the epidemiological bureau. The Punjab Pure Food Bill has now been passed but much still requires to be done in the way of legislation for the improvement of vital statistics, the notification of infectious diseases, and for the better control of epidemic diseases. Perhaps the greatest need in Col. Gill's opinion is some ample provision of power to control recalcitrant local bodies, in the absence of which efforts to help them to help themselves are doomed to fail.

Col. Gill and his staff deserve congratulation and credit for a year's hard and steady work of control and advancement of health ideals.

ANNUAL REPORT OF THE HEALTH OFFICER FOR THE CITY OF RANGOON FOR THE YEAR 1929. THE BURMA GUARDIAN PRESS.

On the 1921 census the birth rate was 23.92 per 1,000; the death rate 31.78. On an estimated population, these rates are lower. The infantile mortality rate was 317.36 per 1,000 registered births. Respiratory diseases and tuberculosis caused by far the largest proportion of the mortality. The death rate from tuberculosis was 2.47 per 1,000—a high figure. An interesting note discusses the causes of the high mortality and suggests some possible remedies. Over-crowding and defective housing conditions are the two

chief evils that require remedy in the opinion of the health officer. Housing bye-laws require alteration and a comprehensive housing improvement scheme seems necessary. A tuberculosis dispensary scheme is outlined. Beriberi causes an appreciable mortality—0.27 per 1,000, though there was no epidemic dropsy reported. There is no statement as to what variety of beriberi is present. Cholera caused 61 deaths. There were 104 cases of plague with 94 deaths. Over 600,000 rats were destroyed during the year, nearly 2 per head of population, this is a good record. Of 38,060 rats examined, 0.35 per cent. were found plague infected. There has been a steady reduction in plague in Rangoon since 1920. Diarrhoea and dysentery accounted for 915 deaths (2.65 per 1,000). Bilibaccine was given a trial as a preventive measure for these diseases. Dwellers in other cities (especially Calcutta) will note with interest that in Rangoon special gangs of coolies are employed to destroy crows nests and eggs during the nesting season, 37,273 eggs were thus destroyed.

The report from the Corporation Laboratory shows a good record of work done.

ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF BIHAR AND ORISSA FOR THE YEAR 1930. PATNA: SUPERINTENDENT, GOVERNMENT PRINTING. B. & O. 1931. PRICE, RS. 3

The staff of the Public Health Department consists of the Director of Public Health, and four Assistant Directors in charge of circles. There is also an officer in charge of the publicity bureau. There is a cadre of 13 epidemic doctors who are sent out to help local bodies in dealing with outbreaks of epidemic disease. Twenty-five other doctors may be recruited on a temporary basis when necessity arises. Five of the larger municipalities employ health officers, three being paid by government. Of the 21 districts, eleven have District Health Officers, 5 receiving help from government towards the expenses of their health organization; school medical officers are also on the public health cadre of the province.

So far as cholera is concerned fairs and *melās* are of considerable importance. At Puri, Gaya, and Sonopore large *melās* are held annually. These receive considerable attention from the public health department. Protection of water and food supplies and anti-cholera inoculation are the main lines of prevention, but during the last three years, bacteriophage has been fairly extensively tried both in towns and districts. Such evidence as has been collected is distinctly in favour of cholera bacteriophage being of use in preventing and shortening outbreaks of cholera.

In 1930 there was a severe epidemic of cholera all over the province. The rainfall was defective, which usually results in cholera being widespread and severe.

Fevers cause the highest mortality of any group of diseases—18.9 per 1,000. There were several outbreaks of malaria in Bhagalpur district. Quinine was distributed for sale in districts and free to certain schools in malarious places.

Blackwater fever occurs in Singhbhum district, and kala-azar is said to be still common in the Gangetic plain throughout the province.

Plague is now confined only to a few districts north of the river Ganges.

Smallpox is not absent from the province in any year. The introduction of compulsory vaccination throughout the province has been thought of, but so far this measure has only been applied to districts with an organised staff.

Respiratory diseases play only a small part in the mortality of this province, in distinct contrast to other provinces where they form a large fraction of mortality causation.

Tuberculosis is not commented on.

The provincial birth rate was 36.2 per 1,000, the death rate 29.6. No special mention is made of the infantile mortality.

ANNUAL REPORT OF DIRECTOR OF PUBLIC HEALTH OF THE CENTRAL PROVINCES AND BERAR FOR THE YEAR 1930. NAGPUR: GOVERNMENT PRINTING. C. P. 1931. PRICE, RE. 1-8

The Central Provinces has the highest birth rate in India (47.74 per 1,000) but it has also the highest death (37.76) and the highest infantile mortality in India (241.82 per 1,000 births). Fever causes by far the highest mortality (20 per 1,000). There is a high peak in May and another in September and October.

The latter peak is probably principally due to malaria; the cause of the hot-weather peak is doubtful, probably influenza is one of the chief factors. Cholera would appear to be almost endemic in some places but mainly seems to be introduced from without especially by returning pilgrims from *melās* and fairs. An interesting graph gives the mortality from cholera in the Central Provinces since 1891; the last big epidemic was in 1921. The improvement of water supplies is, of course, the chief preventive measure to be aimed at, but inoculation and epidemic dispensaries are the two means chiefly used at present to check the spread of the disease. The absence of epidemic cholera in the famine camps is cited as a strong measure in favour of inoculation, but surely there have been well-run famine camps before with no epidemic cholera and no inoculations. Smallpox is much too common and regarded with indifference by the masses. The supervision of the vaccinating staff is unsatisfactory; this is due mainly to the absence of any organised health staff in the districts. The necessity for a district health staff is urgent and this should no longer be delayed if rural public health is to be treated seriously.

Leprosy is being tackled very efficiently by treatment centres; 32 such centres are now in operation. They are in charge of assistant medical officers. Over 700 new cases of leprosy were discovered. The high infantile mortality naturally gives much concern; welfare centres are run by the welfare committee of the Red Cross Society, financed by grants from Government and the Red Cross Society. Government grants have had to be largely cut down, however, and work will have to be curtailed. A model centre exists in Nagpur, a nursery school at Pachmari, and a village circle has been started as an experiment. In addition there are 9 welfare centres, and a health school training for health workers.

Isolation hospitals are badly required in every town. Health progress both in towns and villages seems beset with many difficulties but steady if slow progress is being made. The publicity work seems well organised and the bulk of the preventive work would appear to fall on the epidemic dispensaries.

We wish the Director of Public Health and his staff every encouragement in their uphill work.

REPORT OF THE MEDICAL OFFICER OF HEALTH OF COLOMBO FOR 1930. PRINTED AT THE MUNICIPAL PRINTING OFFICE, CEYLON

In reading the various reports of health officers of tropical towns, one is struck by the fact that tuberculosis is really the main problem. It overshadows any tropical disease. In Colombo, pneumonia and bronchopneumonia caused 925 deaths in 1930, and tuberculosis 626 deaths (of which 583 were returned as due to pulmonary tuberculosis). The health officer has in this report included a comprehensive review of tuberculosis, especially as regards the local problem in Colombo. The mortality from tuberculosis would actually not seem to be on the increase, but the mortality though stationary is high. Certain areas of Ceylon and even streets would seem to be specially favourable for phthisis. Mahomedan women suffer more than any other class, Singalese and Malays being peculiarly susceptible. Age distribution analysis puts the greatest number of cases at 20 to 30 years of age,

climate, housing, malnutrition habits and customs are the contributory factors and suggestions are given in the note as to the best lines of preventive measures that should be adopted in the future. How far these proposals are financially and administratively possible is not stated. They are on the lines generally advocated in other countries and towns.

A devastating flood in the town produced a considerable rise in the mortality rates, especially in infant deaths, and in the diarrhoea and enteric rates.

The most interesting part of the report is perhaps the annexure on the protection of the interior of the island of Ceylon from plague. This is reviewed in a special note elsewhere.

The birth and death rates per 1,000 for 1930 were 33.9 and 29.3, and the infantile mortality rate 179 per 1,000 births. The maternal mortality rate was high being 30 per 1,000 births.

The activities of the various health agencies and departments are interestingly described.

Correspondence

LATE ERUPTION OF WISDOM TEETH

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Last month, a man aged 51 stepped into my consulting room complaining of pain in the right upper jaw at its posterior end, with inability to open the mouth completely.

On examining the mouth, the two upper wisdom teeth were not present, whereas in the lower jaw all the sixteen teeth were present. On enquiry he confirmed my suspicion that the two upper wisdom teeth had not erupted.

On the right side the gum over the site of the wisdom tooth was inflamed and shining. I suspected that the erupting third molar would be underneath the thick fleshy covering and so incised the gum. A little inflammatory matter came out and the wisdom tooth was found. The left side is still silent and I think we can expect a similar process repeating itself there at a future date.

Dr. A. Powell, when Police Surgeon of Bombay, according to a very large series of observations by him says that the wisdom teeth appear between the 14th to 27th year (Lyon's *Jurisprudence*). Saunders, Pedley, Gray and Mann give the following figures for the eruption of the wisdom teeth, viz, 18th to 25th; 17th to 25th, 17th to 21st; 18th to 30th years respectively (Lyon's *Jurisprudence*). Further Powell says 'In natives of India a few exceptions may be found to these figures, but these exceptions will be found on the precocious side, rarely at later dates'.

In view of the above fact, this case seems to be interesting.—Yours, etc.,

K. VENKAT RAO, L.M.S.

PURASAWALKAM VEPERY,
MADRAS,
11th January, 1932.

IS BISMUTH SAFE FOR INTRAVENOUS USE?

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—While we have some reports in India of bismuth having been safely used by the vein, the reports from abroad are disconcerting. Lieut.-Col. R. N. Chopra has reported good success in four cases of frambæsia, by intravenous administration of 'Bisnene' an organic aromatic compound of bismuth (*Indian Med. Gaz.*, July 1928). Col. Palmer has reported good results from the use of bismuth potassium tartrate in a case of Madura foot (*Indian Med. Gaz.*, September 1928). But there are warnings issued by other workers well qualified to speak on the matter.

Opening a discussion at the Imperial Social Hygiene Congress on the 'Choice of Remedies in Syphilis', Col. L. W. Harrison said, 'Intramuscular injection (of bismuth) had a higher therapeutic index and margin of safety than intravenous; the latter route presented the drug so suddenly that toxic effects were likely to supervene' (*Lancet*, July 25th, 1931, p. 205). And when Harrison says anything on syphilis and its treatment one should think well before hazarding an opposite opinion. In the discussion that followed Col. Harrison's opening remarks, Lt.-Col. E. T. Burke said he thought the intravenous administration of bismuth absolutely contraindicated (*Ibid.*, p. 205).

In the *Journal of the American Medical Association*, (November 22nd, 1930), Dr. Stephen H. Curtis has reported a case of sudden death following the intravenous injection of bismuth tartrate. The patient had had a course of ten injections of 15 mgm. each of bismuth tartrate suspended in 5 c.cm. of sterile distilled water. 'It is interesting to note that within half an hour after the administration of each dose, the patient was seized with abdominal pain, resulting in one or two watery stools, after which the reaction promptly disappeared and the patient felt quite normal again'. The blood Wassermann reaction showed a definite improvement, and so after a rest of one month another course of bismuth was decided upon. The usual dose of 15 mgm. of bismuth tartrate, suspended in 5 c.cm. of sterile distilled water, was given intravenously (eleventh injection). Immediately the patient became pale and cyanosed, there being no pulse at the wrist. One cubic millimetre of epinephrine hydrochloride was administered directly into the ventricular wall, but there was no response. The patient had died. Dr. Curtis says that he had safely used bismuth with the same technique (by the vein) in ten other cases, without any systemic reaction whatever and with benefit to the patients and thinks that this particular patient may have had an idiosyncrasy towards bismuth. Dr. George W. Raiziss, commenting on this case (*Journ. Amer. Med. Assoc.*, January 17th, 1931), says, 'I have always been opposed to the employment of bismuth products intravenously, owing to the high toxicity by this route'. The editorial comment on this case in the same issue of the journal says that the attitude of the Council on Pharmacy and Chemistry and of the *Journal of the American Medical Association* has always been one of strict warning against intravenous bismuth therapy. The 'New and Non-official Remedies' issued by the American Medical Association gives a distinct caution that the therapeutic dose approaches too closely the toxic when bismuth is used intravenously.

I have never used bismuth by the intravenous route. It would be interesting to know your views and those of your readers on this matter.—Yours, etc.,

K. V. THAKKAR, L.M. & S. (Bom.).

MAMA KOTHA ROAD, BHAVNAGAR,
KATHIAWAR,
7th January, 1932.

ANTAGONISM IN DISEASES

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I have read with interest Dr. J. E. L. Chinal's note on 'Vaccination and Whooping-Cough' in your issue for November 1931, in which he has related a case of whooping-cough cured by vaccinating the patient. This comes to an induction of leucocytosis by superimposing another infection on the one from which the patient is already suffering. Some years ago, I read a paper before the Kathiawar Medical Society at Rajkot (*Proceedings*, March 1917), on 'Antagonism in Disease; a Clinical Note', where I described three cases in which the natural advent of a second and more virulent infection had helped to cure the patient of his original complaint. One of the three cases was that of a child of four months, who was attacked with smallpox in the course of a severe

attack of whooping-cough. As the smallpox developed the whooping-cough receded and it disappeared completely in the beginning of the second week of smallpox. The second case related by me was that of a Hindu lady aged 22 years who had been suffering from chronic sprue-like diarrhoea for some years and got permanently cured of it after a severe attack of typhoid fever. In the third case, the patient was cured of her complaint of chronic dysentery of two years' duration after an attack of bubonic plague.

Rogers has referred to desperate cases of kala-azar being cured after the advent of complications like amebic dysentery and cancrum oris or other septic conditions. 'I have therefore thought it may be inadvisable to cure too quickly an amebic infection in kala-azar, as long as it is kept under sufficient control to prevent it seriously weakening the patient' (Rogers' *Dysenteries*, p. 279). In these cases, Rogers ascribed the cure of kala-azar to the leucocytosis induced by the superadded infection.

In much the same category, perhaps, are cases where one disease gets elbowed out temporarily in the presence of a newly added one. The disappearance of malarial parasites in the presence of typhoid infection is an instance in point. In a recent case under my care of epidemic encephalitis, it was noticed that the patient had got rid of her diabetes, though temporarily, for a period of a few months only. It is difficult to believe that mere leucocytosis is responsible for the temporary elbowing out of the older malady. In typhoid, there is no leucocytosis and so in my second case mentioned above, that factor is put out of court. It may be that the new infection in such cases acts in much the same way as malarial toxin does in a case of general paralysis of the insane.—Yours, etc.,

K. V. THAKKAR, L.M. & S. (Bom.).

BHAVNAGAR, KATHIAWAR,
5th December, 1931.

A TUBERCULOSIS SCHEME

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I have read with great interest the two tuberculosis schemes published in one of the previous issues of the *Gazette* (September 1931), as well as your editorial on them.

There can be no doubt that the problem of tuberculosis is getting serious in India. It is a recognized fact that the disease is on the increase at the present moment. This is but natural for, like England and other Western countries, with the growth of industries—urbanisation, as one may call it—in this country, the chances for infection and the consequent spread of the disease must increase and a time will ultimately come, as has already arrived in England, when, with the establishment of 'immunogenity'—as distinguished from 'immunity'—the progeny will offer greater resistance to infection with the result that the mortality will also decrease.

Meanwhile, some measures must be adopted to deal with the problem. The scheme of Dr. McGuire, as you have rightly observed, is not practical. He asks for complete isolation of the diseased as well as the contacts. He might as well have asked to drown them in the ocean or throw them into Vesuvius. This is not practical and we must think of something else to fight the scourge.

Dr. Wazir Singh's scheme is more practical. His suggestion about the use of B. C. G. is laudable but I agree with you, Mr. Editor, that there will be opposition to it in some quarters. There has been a great deal of controversy over B. C. G. The experiments of Petroff in America with it and his isolation of what are called the 'R' and 'S' colonies from it as well as the recent fatal accident to a number of children with its use in Lubeck (Germany) should make us pause and think thrice before we recommend its use on a wholesale scale.

Dr. Wazir Singh's suggestion about turning dark and ill-ventilated houses into airy and sunny ones as well as the widening of streets and lanes is very good

indeed, but this is not so easy as it looks on paper. It would require huge capital to destroy century-old cities and towns and build new ones. But wherever possible, this should certainly be done.

To my mind, a very practical scheme to tackle this menacing problem of tuberculosis in India would be as follows:—

- (1) Notification of all tuberculous cases.
- (2) Tuberculosis dispensaries.
- (3) Hospitals for 'advanced' cases.
- (4) Sanatoriums for 'early' cases.
- (5) After-care societies, and colonies and settlements for ex-patients.

It will be observed that every heading in the above scheme works like a link in the chain—the whole scheme forming the chain.

Space will not permit me to discuss each heading in detail, but the headings will speak for themselves. I should only like to say here that the tuberculosis dispensary forms perhaps the most important link in the chain, and Dr. Wazir Singh's scheme will come within its scope. The dispensary aims at hunting down the infection, discovering the haunts and methods of the invader and raiding him in his own territory. Its important functions are to serve as (1) a receiving house, (2) a clearing house, and (3) a centre for observation, investigation, information, and propaganda.

If the campaign against tuberculosis is carried out on the above lines, it should, in my opinion, go far in checking the spread of the disease and reducing the death-rate. Mr. Editor, you will agree with me that this is not the work of one or two individuals. It will need the willing co-operation of the public and the State. The Local Self-Government bodies, by which I mean the municipalities and local boards, must take up the work in right earnest. Every district or combination of two or more districts should establish a dispensary, hospital, and sanatorium of its own. It is not at all necessary to spend large sums of money on buildings which are after all only means to an end.

It goes without saying that each big city and town and each district must be provided with well-trained tuberculosis officers just as they are provided with medical officers and health officers.—Yours, etc.,

Y. G. SHRIKHANDE,
B.Sc., M.B., B.S., T.D.D. (Wales).

KING EDWARD VII SANATORIUM,
BHOWALI, U. P.,
14th December, 1931.

ANTISERA BY THE MOUTH

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Would you please or any of your readers kindly let me know through the medium of your journal if serums—such as antidiphtheritic, antitetanic, anti-streptococcal polyvalent and especially normal horse-serum, etc., have any curative value in the human system if they are administered *by the mouth*. Do they not lose their efficacy by coming in contact with the acid gastric juice? Even if they are orally administered on an empty stomach, do these serums maintain their efficacy equally well and are they as efficacious as if they have been given by the subcutaneous method, leaving aside the question of the urgency of the case so that the rapid action of the drug is not wanted. In no textbook on medicine do I find any mention of the oral method of administration of serums (especially antisera) although this method is frequently adopted by medical practitioners, even of repute—especially in children and the aged and those who refuse injections—not only of this place but in various parts of Bengal, either as an adjunct to or substitute for the subcutaneous method. If oral administration of serum has no curative value, does it not create a false hope in the minds of both the patients and the practitioner and is it not simply a waste of money and medicine?

Your opinion or the opinion of an authority on the subject would be of great help not only to me but to other medical practitioners and will clear away the

false notion of the mode of administration of a drug so frequently used.—Yours, etc.,

K. M. BASU, M.B., CAPTAIN
I.M.S. (late),
Assistant Surgeon and Teacher,
Jackson Medical School.

JALPAIGURI,
24th December, 1931.

(Note:—We are not aware of any observations specifically directed to the question whether antitoxic sera orally administered are effective or not. The object of the use of an antitoxic serum is usually to obtain an immediate effect in an acute disease in which there is either no time or the patient is too ill to obtain an effective reaction to active immunisation by vaccines. The attainment of this result depends upon rapid absorption and the antiserum is consequently introduced parenterally. It has been estimated that with diphtheria antitoxin intravenous injection is 500 times more potent therapeutically than by the subcutaneous route, and 80 to 90 times more so than by the intraperitoneal route. As regards the production of active immunity it is ordinarily not possible to use the intestinal route as a means of obtaining a potent antiserum. We may conclude that protein antigens do not in any quantity pass the normal intestinal barrier unchanged. As the antitoxins are associated with the large globulin complex it is consequently unlikely that any immediate therapeutic effect could be produced by oral ingestion. It is known that anaphylactic sensitisation may be effected by any parenteral method of injection. The question as to whether sensitisation by the intestinal canal is possible or not has been much discussed. Results on this are somewhat conflicting, but it seems that after laparotomy injections of protein antigen into the large intestine can sensitise, while similar injections into the stomach or small intestine fail to do so. This possibly implies a destructive action of the gastric and pancreatic secretions on the antigen. The very minute quantities of antigen necessary for anaphylactic sensitisation must be remembered. On the whole, it appears that the absorption of unchanged protein from the intestine is slow and slight. It would seem, therefore, that the oral use of an antitoxic serum during an acute attack of the disease would be of little or no value. The oral ingestion of normal horse serum may possibly have some value in the local treatment of hæmorrhage from the stomach, though this has been doubted.—Editor, I. M. G.)

Service Notes

APPOINTMENTS AND TRANSFERS

COLONEL G. C. L. KERANS, D.S.O., has been appointed as Honorary Surgeon to H. E. the Viceroy, with effect from the 10th August, 1931.

Lieutenant-Colonel M. A. Nicholson has been posted as Residency Surgeon, Mewar, with effect from the 16th November, 1931.

Lieutenant-Colonel E. E. Doyle, C.I.E., D.S.O., on return from leave, to be Inspector-General of Prisons, Bombay Presidency.

Major R. Hay has been posted as Agency Surgeon in Bundelkhand, with effect from the 21st December, 1931.

The services of Major L. A. P. Anderson, officiating Director, Haffkine Institute, Bombay, were replaced at the disposal of the Government of India, Department of Education, Health and Lands, with effect from the date on which he relinquished the charge of that post.

Major M. G. Bhandari, Superintendent and Medical Officer, Yeravda Central Prison, to continue to do duty as Superintendent and Medical Officer, Yeravda Central Prison, vice Major R. V. Martin, proceeding on leave.

Major S. N. Makand has been confirmed as Health Officer, Simla, with effect from the 25th February, 1931.

The services of Major R. H. Malone, an officer of the Medical Research Department, have been placed permanently at the disposal of the Government of Burma, with effect from the date on which he assumed charge of his duties under the local Government.

Captain C. K. Lakshmanan has been confirmed in the rank of Captain.

LEAVE

Lieutenant-Colonel K. G. Gharpurey, Civil Surgeon, Ahmednagar, is granted leave on average pay for four months, with effect from 8th February, 1932, or date of relief.

Major J. Rodger, M.C., has been granted combined leave for 12 months, with effect from the 16th November, 1931.

PROMOTION

The promotion of Major K. R. Batra to the rank of Major has been ante-dated to the 6th February, 1926.

RETIREMENTS

Lieutenant-Colonel A. S. M. Peebles, with effect from the 20th November, 1931.

Lieutenant-Colonel W. C. Gray, M.C., with effect from the 8th November, 1931.

Lieutenant-Colonel H. S. Matson, with effect from the 8th December, 1931.

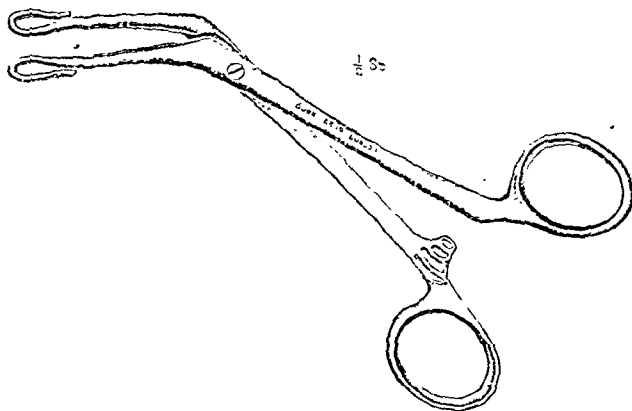
Lieutenant-Colonel T. W. Harley, C.I.E., with effect from the 10th December, 1931.

Notes

A NEW SUTURE-HOLDING FORCEPS

By W. H. OGILVIE

THE continuous suture, rare on the continent but almost universal in Britain, requires that the material shall be held taut after each stitch, to prevent slack developing in the suture line. In most surgical operations this is best done by the hands of the assistant. In bone and joint surgery, where 'no touch' methods are an essential part of good technique, this is not



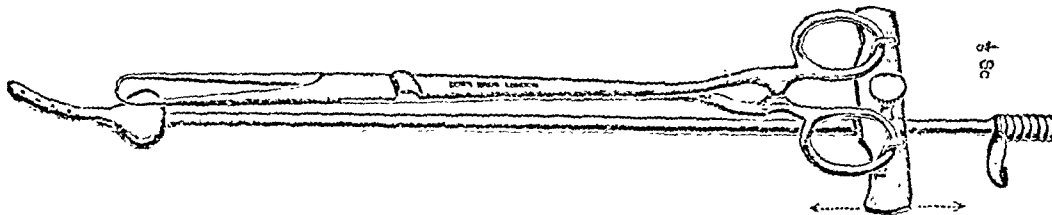
permissible, and the surgeon must either use interrupted stitches, or employ some form of suture-holding forceps. The usual patterns have metal jaws which, though smooth, weaken the suture material considerably where they grip it, so that it may break at the time or afterwards, allowing the whole length of the suture line to gape. This accident is very liable to happen with the fine 00 catgut usually employed for tendon suture, for approximating the synovial membrane and capsule of a joint, or for closing the soft tissues over a bone. Down Brothers have made for me a pair of suture-holding forceps whose general design is that of the familiar Guy's pattern, but whose blades end in a rounded loop open at one end, over which is slipped a length of fine rubber tubing. The rubber gives a secure grip, but cannot injure the finest gut; it can, of course, be renewed when worn.

AN UTERINE CANNULA FOR THE RUBIN TEST

By W. C. SPACKMAN, F.R.C.S.E.

MAJOR, I.M.S.

The uterine cannula here illustrated has been made for me by Down Brothers, Ltd., St. Thomas's Street, London, S.E.1, and has proved very effective in use. It is designed to be used for the Rubin test for patency of the Fallopian tubes with any of the inflation methods. Its special feature is the sliding bracket to take the finger holes of the vulsellum. The latter is applied as usual to get a good grip of the cervix on its vaginal aspect in the anterior fornix. The cannula is now passed in the usual manner (it is of a size that no dilatation is needed as a rule) till the acorn is firmly pressed into the external os. The handle of the



vulsellum is now applied on to the hooks of the bracket which is firmly braced outwards by two fingers of the right hand against the pressure of the thumb of the same hand on the thumb grip on the outer end of the cannula. When by this means the tension of the acorn against the cervix is deemed to be adequate, the bracket is fixed by the finger screw provided. The cannula and vulsellum are thus easily controlled by one hand while the inflation is carried out.

THE B. D. H. UREAMOMETER OUTFIT

This very compact and portable little outfit has been designed by the British Drug Houses, Ltd., to provide general practitioners, house physicians, and others with a simple and ready means of estimating the blood urea at the bedside, or when the services of a biochemist are not available. The method employed is essentially that of Twort and Archer, slightly modified to secure simplicity. The estimation can be carried out in 35 to 40 minutes, and at any time within 24 hours of taking the sample of blood.

The following are notes with regard to the contents of the outfit and its method of use.

The B. D. H. ureamometer outfit contains the following apparatus and reagents:—

- 1 0.1 c.cm. blood pipette.
- 1 0.5 c.cm. graduated pipette.
- 1 thermometer 40–60°C.
- 1 stirring rod.
- 2 test tubes with graduations at 1 c.cm. and 3 c.cm.
- 4 do. do. do. at 5 c.cm.
- 1 funnel.
- 1 aluminium water bath and lid.
- 1 1 c.cm. measure.
- 1 bottle Nessler's reagent.
- 1 bottle trichloroacetic acid solution.
- 1 tube urease tablets.
- 1 bottle standard ammonia solution (1 c.cm. = 0.1 mgm. urea).
- 1 needle bayonet.
- 1 test tube.
- 1 packet filter papers.

Determination of Blood Urea

Take 0.1 c.cm. of blood from a finger-prick or ear-prick by means of the blood pipette, and add it to 1 c.cm. of water in a test tube. Add one urease tablet, and break it up by means of the stirring-rod; immerse the tube in water in the aluminium water-bath, keeping it at a temperature of about 50°C. for 15 minutes. To the contents in the tube add 0.2 c.cm. of trichloroacetic acid solution, and allow the mixture to stand for 10 minutes; then dilute to 3 c.cm. with water, filter through a piece of filter paper (previously well washed

with water) into another test tube, and wash the filter with water until the volume of the filtrate is 5 c.cm. Into three other test tubes place respectively 0.4, 1.0 and 1.5 c.cm. of the standard ammonia solution, and make each up to 5 c.cm. with water.

To each of the four test tubes add 1 c.cm. of Nessler's solution, stir the contents and allow to stand for about two minutes. At the expiration of this time compare the colour of the tube containing the solution under test with the colours of the other tubes, looking down through the length of the tubes at an angle against a white background.

The three tubes containing the standard ammonia solution correspond with 40, 100 and 150 mgm. of urea per 100 c.cm. of blood, and by comparison of the colour the approximate amount of urea in the sample taken

is readily estimated. More accurate results may be obtained, if desired, by carrying out a further test using different quantities of standard ammonia solution covering a narrower range.

General Notes

Tap water should be used throughout for the estimation in preference to distilled water, which often contains traces of ammonia.

As traces of Nessler's solution adhering to the walls of a test tube prevent the action of the urease, the tubes graduated at 5 c.cm. should be kept for the final test, and the tubes graduated at 1 c.cm. and 3 c.cm. reserved for the operations prior to filtration.

The normal amount of urea in the blood is 20 to 40 mgm. per 100 c.cm.

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Original Articles

ATEBRIN: A SYNTHETIC DRUG FOR THE TREATMENT OF MALARIA*

By L. EVERARD NAPIER, M.R.C.S., L.R.C.P.
and

ASSISTANT SURGEON B. M. DAS GUPTA

Assistant Professor of Protozoology

(From the Calcutta School of Tropical Medicine)

It is not necessary to make any apology for carrying out an investigation into the action of a reputed 'specific' for malarial fever. For centuries the cinchona alkaloids have held the field; no other drug has been discovered that has any action on the parasite of malaria comparable to that of the cinchona alkaloids. Nevertheless, no one of these alkaloids is an ideal drug, nor does any combination of them constitute an entirely satisfactory treatment for the disease.

Treatment of malaria should be considered from two points of view, the patient's and the general community's; from the point of view of the former, the asexual forms of the parasite, which multiply in the body and produce the fever, must be destroyed, whereas from the point of view of the community the destruction of the gametocytes, which are the source of infection for transmitting mosquitoes, is of primary importance. (It is, of course, true that, as the gametocytes are formed from the asexual forms, destruction of the latter will eventually lead to disappearance of the former from the peripheral blood). From the point of view of the patient, short of the ideal, the *therapia magna sterilans*, the properties required of an anti-malarial drug are that a few doses shall produce rapid alleviation of the clinical symptoms, that a reasonable number of doses shall destroy all the malarial parasites in the body, and that in the doses in which it is necessary to give the drug in order to achieve this it shall be non-toxic; in addition it is important that it shall be pleasant and easy to take and that it shall not give rise to disagreeable symptoms.

A measure of the efficacy of a drug is the number of doses or the time in which these results are brought about.

Quinine, probably, the most useful of the cinchona alkaloids, does not fulfil all these requirements: it produces rapid alleviation of the clinical symptoms, but in a number of cases it does not destroy all the parasites, even after

a considerable course of administration; it is not toxic in the doses in which it is usually given, but it is not pleasant to take and in many individuals it gives rise to unpleasant symptoms.

There is unfortunately no certain means of proving that all the parasites have been destroyed; (a) immediate clinical observation of the patient, (b) examination of the peripheral blood by the thin-film, the thick-film or cultural methods, and (c) clinical observation of the patient combined with repeated examination of the peripheral blood by the various methods suggested above over a long period, are methods that have been employed; we have given these in the order of their efficacy. If the time of observation is long enough—Sinton considers 12 weeks adequate—this last method of proving that the parasites have been destroyed is very satisfactory, *but can only be carried out in a non-endemic area where there is no risk of re-infection.*

Plasmochin, a quinolin derivative, prepared in the laboratories of Bayer-Meister Lucius, at Elberfeld, has been very extensively used during the last six years. It has proved an invaluable adjuvant in the treatment of the malarial attack and, by its action on the gametocytes, a new and powerful weapon for the sanitarian. But this drug appears to have no action whatsoever on the asexual forms of *Plasmodium falciparum*, so that by itself in the treatment of malignant tertian fever it is of no value.

Atebrin, a synthetic drug allied to Plasmochin, has been produced in the same laboratories. It is claimed by the manufacturers that its action is complementary to that of Plasmochin; that is to say, whereas Plasmochin acts mainly on the sexual forms, Atebrin acts only on the asexual forms. Hitherto no results of the treatment by this drug have been published, but patients with induced malaria and a few suffering from a naturally-acquired infection of each species of plasmodium have been treated by this drug, with apparently successful results. The manufacturers, when giving the senior writer samples of this drug, kindly communicated the results of these previous trials. From these it is apparent that a dose of one tablet, i.e., 0.1 gramme, three times daily, is a safe dose.

In this investigation we have not made any attempt to appraise the *relative* value of Atebrin as an anti-malarial drug, nor to work out a dosage that will produce a complete cure, but we have tried to find out whether or not it has any effect on (i) the malarial fever and (ii) the parasitic content of the peripheral blood, and (iii) whether its administration gives rise to any toxic or disagreeable symptoms.

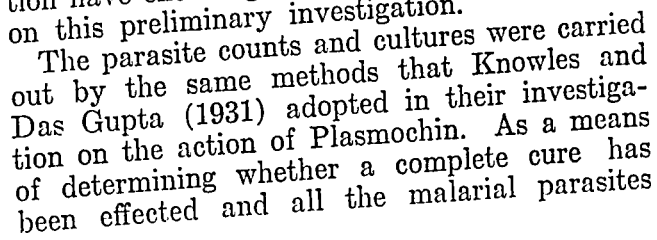
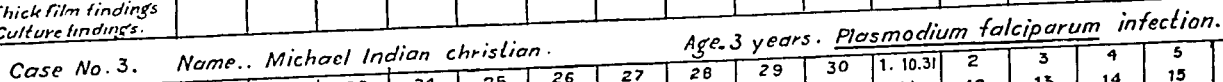
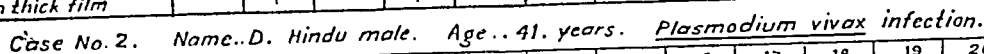
Our choice of dosage was entirely arbitrary, but we maintained the same dosage—subject to suitable modification in the case of children

* This paper was received for publication in November 1931, and would have appeared in the December number of the *Gazette* had not the manufacturers requested us to withhold publication temporarily.

This drug was first issued under the name 'Erion', but it has now been registered, and will be placed on the market, under the name 'Atebrin'.—EDITOR, I. M. G.

The conclusions we have been able to draw, though not far-reaching, are quite definite; this and the fact that the senior writer will have no

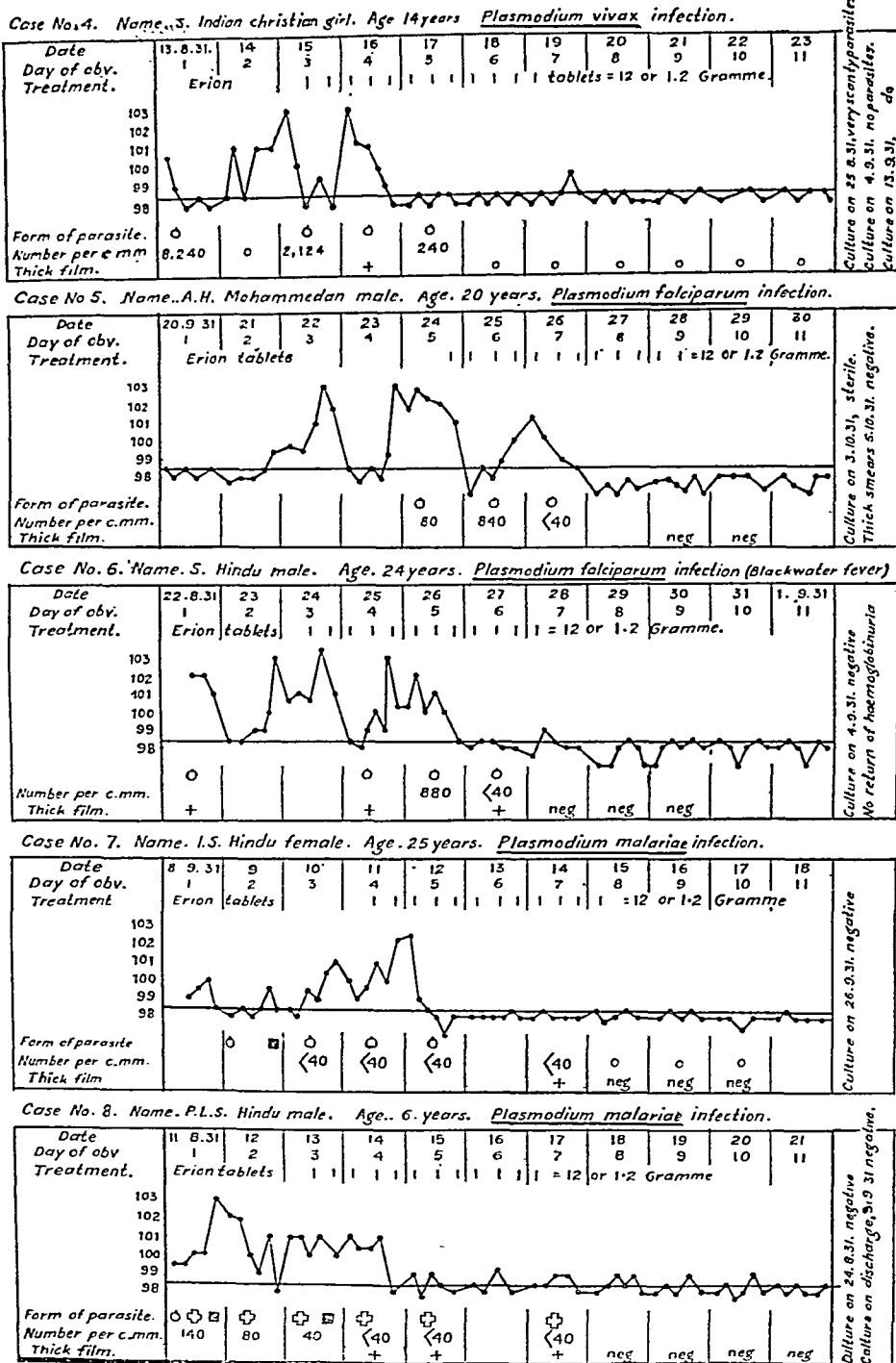
Case No. 1. Name.. K. A. Hindu male. Age.. 22 years. Plasmodium vivax infection.



destroyed, it is probably inferior to that adopted by Sinton and his colleagues, method (c) referred to above, but the latter method could

charts the treatment and the results of the parasite counts and cultures have also been entered. In the other three cases the treatment

CHART 2



Showing the results of treatment in five other cases of malaria.

not be adopted in Calcutta which is a malaria-endemic area.

In the 8 cases in which fever was a prominent clinical feature the temperature charts (charts 1 and 2) are reproduced; in these

and the parasitic findings are given in tabular form (tables I, II and III). We have made these charts and tables, as far as possible, self-explanatory. Little further discussion of the cases is necessary. Case 6 was a patient sent

in with a clear history of blackwater fever, but whilst in hospital he showed no signs of hæmoglobinuria, either before or after treatment.

In no case were any toxic or disagreeable symptoms noted or complained of, nor was any yellow colouration of the skin observed.

Short analysis of the results.

(i) In all 8 cases in which fever was a prominent symptom this was controlled within a short period; after administration of Atebrin the average time of duration of fever was less than 2 days. In case 8 the temperature fell to the 99° level only, but the persistence of this low fever appears to have been due to some cause other than malaria, as it continued for some days, despite the complete disappearance of parasites from the peripheral blood; in the other cases the temperature fell to normal. The mean of the number of doses of Atebrin given prior to the final fall of temperature was 5.25, the maximum number was 8 and the minimum 2. In the cases of *P. vivax* and *P. malariae* infection the mean number of doses was 4, and in the three cases of *P. falciparum* infection it was 7.3.

(ii) The asexual forms of the parasites disappeared rapidly from the peripheral blood in every case. By the thick-film method the latest day on which they were demonstrated was the 5th day from the first administration of Atebrin. Taking the mid-point of the means of the last days on which parasites were found and the first days on which they were not found, we can calculate that the probable length of time parasites persisted in the peripheral blood in sufficient numbers to be demonstrated by this method was 3.6 days.

By cultural methods the earliest day asexual forms were shown to be absent was the 6th day and the latest the 21st day; the mean of the series was 11.7 days. In two cases a scanty infection was demonstrated by culture on the 6th and 11th days, respectively.

The drug appears to have no action on the sexual forms, at any rate on those of *P. falciparum*. In two cases in which crescents were present before Atebrin administration, they persisted until Plasmochin was given; in another case they made their first appearance after the complete course of Atebrin had been given; and of the other three cases of *P. falciparum* infection in one Plasmochin was given before Atebrin and in two no crescents were seen either before or after Atebrin administration.

(iii) None of the patients complained of any unpleasant taste or other ill effects from the administration of the drug.

No toxic symptoms were observed. In no case did we notice any yellow colouration of the cornea, which the manufacturers reported might occur.

One of our patients was a case of blackwater fever; there was no return of hæmoglobinuria when Atebrin was administered.

The results are summarised in table IV.

Possible prophylactic action of Atebrin

A small experiment which, though isolated, is perhaps worth recording, as the opportunity to repeat it may not arise in the immediate future. It was carried out in collaboration with Dr. C. Strickland and Dr. D. N. Roy, respectively, Professor and Assistant Professor of Entomology, Calcutta School of Tropical Medicine.

A boy aged 14 under treatment in hospital for dermal leishmaniasis allowed himself to be bitten by 9 *Anopheles stephensi* which had previously been infected from a patient suffering from malignant tertian malaria. All the mosquitoes took a full feed and on dissection 8 were found to be heavily infected; the other died and was not examined. The boy was given one tablet of 0.1 gramme of Atebrin on the day before the mosquitoes fed on him and the same dose on the six following days. During this time he was given no other drug. He has now been under observation for two months and has had no fever. Repeated blood examinations have failed to demonstrate any parasites.

Dr. Strickland informs us that a few days prior to this experiment mosquitoes from the same batch had been fed on two other volunteers and that on both occasions they caused a malarial attack.

There are strong indications therefore that this prophylactic dosage was sufficient to prevent malarial infection in this boy.

Conclusions

(a) Our observations appear to justify the conclusions that in all three plasmodial infections Atebrin, in doses of 0.1 gramme thrice daily for 4 days,

(i) controls the fever,

(ii) brings about the disappearance of the asexual forms of parasite from the peripheral blood, and

(iii) is neither toxic nor unpleasant to take.

(b) Atebrin does not destroy, or even prevent the formation of, the sexual forms of *Plasmodium falciparum*.

(c) We cannot say whether or not the short course which we administered will produce a complete cure; if it does in any considerable percentage of cases, Atebrin should prove a very valuable drug. Furthermore, we do not know whether the doses we gave represent the limit of safe administration; on the other hand we do not know that even these doses may not prove toxic to certain sensitive individuals.

(d) We cannot express an opinion as to whether it is more, or less, efficacious than quinine, but we have gained the impression that it does not act as rapidly as this alkaloid.

(c) In one case in which it was given, Atebrin, in a dosage smaller than the curative dosage, appears to have had a prophylactic action.

(f) These preliminary experiments are very encouraging and certainly justify further expansion of this investigation.

Acknowledgments

Our thanks are due to the firm of Bayer-Meister Lucius of Leverkusen, and to their representative in India, Dr. O. Uehls, for kindly placing at our disposal a large quantity of Atebrin and Plasmochin for carrying out these and other investigations.

Our thanks are also due to Lt.-Col. H. W. Acton, C.I.E., I.M.S., Director of the Calcutta School of Tropical Medicine and Hygiene, and to Dr. S. P. Bhattacharyya, Officiating Professor of Tropical Medicine, for putting their malaria patients at our disposal, and to the Registrar of the Carmichael Hospital for Tropical Diseases, Dr. J. C. Gupta, M.B., for much practical assistance.

TABLE I

Case 9. Anglo-Indian child—male. *Plasmodium falciparum*

Date	Treatment	Form of parasites	Number of parasites per c.mm.
25-9-31		Crescents	320
26-9-31	Atebrin $\frac{1}{4} \times 2$ tablets	Rings	Less than 40
		Crescents	Less than 40
27-9-31	" $\frac{1}{4} \times 2$	Not examined	
28-9-31	" $\frac{1}{4} \times 2$	Crescents	80
29-9-31	" $\frac{1}{4} \times 2$	Crescents	Less than 40
30-9-31	" $\frac{1}{4} \times 2$	Crescents	80
1-10-31	" $\frac{1}{4} \times 3$	Crescents	240
		Culture:—Scanty trophozoites	
3-10-31		Crescents	Less than 40
5-10-31		Culture:—No asexual forms	
		..	0

At the time of admission the patient had low, irregular fever up to about 99.5°F. This slowly subsided to normal. Discharged on 3rd November, 1931.

TABLE II

Case 10. Y. Y., European female, aged 15 years. *Plasmodium falciparum*

Date	Treatment	Form of parasites	Number of parasites per c.mm.
25-9-31	..	Trophozoites	120
26-9-31	Atebrin 1×2 tablets	Crescents	Less than 40
		Trophozoites	480
27-9-31	" 1×3	Not examined	
28-9-31	" 1×3	..	0
29-9-31	" 1×3	..	0
30-9-31	" 1×1	Crescents	Less than 40
1-10-31	}	Crescents	Less than 40
3-10-31			

TABLE II—concl'd

Date	Treatment	Form of parasites	Number of parasites per c.mm.
4-10-31	Plasmochin 0.01×2	Not examined	
5-10-31	Plasmochin 0.01×2	..	0
6-10-31	Plasmochin 0.01×2	..	0
7-10-31	}	Not examined	
8-10-31			
9-10-31			
10-10-31			
	..	Culture:—Negative	0
	..	Quinine now given.	

Fever was never a prominent feature, but after being controlled for a day or two by the first doses of Atebrin it continued between 99° and 100°F. After 10th October, 1931, quinine, 5 grains three times a day, was given; this had no effect on the temperature which was apparently not due to malaria. The patient had sub-acute mastitis.

TABLE III

Case 11. C. C. *Plasmodium vivax* and *P. falciparum*

Date	Treatment	Form of parasites	Number of parasites per c.mm.
Before admission.	..	Trophozoites (<i>P. v.</i>) and crescents.	Scanty
12-9-31	..	Crescents	120
14-9-31	..	Crescents	80
15-9-31	..	Crescents	120
16-9-31	}	Crescents	40
17-9-31			
18-9-31			
19-9-31			
20-9-31	..	Crescents	Less than 40
21-9-31	..	Crescents	Less than 40
22-9-31	..	Trophozoites and crescents	Scanty
23-9-31	}	Crescents	Less than 40
24-9-31			
25-9-31			
26-9-31			
27-9-31	Plasmochin 0.01×2	..	..
28-9-31	Do.	..	..
29-9-31	Do.	..	..
30-9-31	Atebrin 1×3 tablets	Trophozoites (<i>P. f.</i>)	120
1-10-31	" 1×3	Trophozoites (<i>P. f.</i>)	Scanty
2-10-31	" 1×3	Trophozoites (<i>P. f.</i>)	200
3-10-31	" 1×3	Trophozoites (<i>P. f.</i>)	Scanty
4-10-31	}	..	0
5-10-31			
6-10-31			
7-10-31			
8-10-31	..	..	0
9-10-31	..	Culture:—Sterile	

Afebrile almost throughout, but on 28-9-31 there was a slight rise of temperature accompanying the reappearance of asexual forms in the peripheral blood. This provocative action of small doses of Plasmochin has been noted by others (Fischer and Weise, 1927).

TABLE IV

Serial No.	Species of parasite	Number of doses of Atebrin prior to final fall of temperature	FROM BEGINNING OF ATEBRIN ADMINISTRATION				
			First day of normal temperature	THICK-FILM METHOD		CULTURAL METHOD	
				Last day on which asexual forms were found	First day on which no asexual forms were found	Scanty parasites present	No parasites present
1	<i>P. vivax</i> ..	5	3rd	3rd	4th	..	8th
2	<i>P. vivax</i> ..	2	2nd	2nd	4th	..	8th
3	<i>P. falciparum</i> ..	7	3rd	5th	7th*	..	..
4	<i>P. vivax</i> ..	5	3rd	3rd	4th	11th	21st
5	<i>P. falciparum</i> ..	7	3rd	3rd	5th	..	10th
6	<i>P. falciparum</i> ..	8	4th	4th	5th	..	12th
7	<i>P. malariae</i> ..	3	2nd	4th	5th	..	16th
8	<i>P. malariae</i> ..	5	3rd †	5th	6th	..	12th
9	<i>P. falciparum</i> ..	..	..	Day before treatment.	1st*	6th	8th
10	<i>P. falciparum</i> ..	..	..	1st	3rd*	..	14th
11	<i>P. falciparum</i> and <i>P. vivax</i>.	..	..	2nd	3rd	..	10th
Mean	..	5.25	2.875	2.91	4.27	..	11.7

* Crescents persisted until Plasmochin was given.

† Temperature fell to the 99° line only.

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FIELD EXPERIMENTS WITH ATEBRIN AND PLASMOCHIN

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The genesis of the enquiry

DURING the last few years a number of children suffering from kala-azar have come to us from the Oxford Mission settlement at Behala, a village about six miles from Calcutta, and have been treated in the Carmichael Hospital for Tropical Diseases. We have from time to time visited this settlement, as it was thought that a study of the conditions might throw some light on the transmission problem. Except that they are more sanitary, the general conditions under which these boys live are very similar to those prevailing in the ordinary Bengal village; the huts in which they live are constructed with bamboo and plaster, the floors are of mud, and the roofs are thatched. The

compound is closely surrounded by villages, in a part of the country in which kala-azar is endemic and which is intensely malarious. *Phlebotomus argentipes* can be found in the huts at most times of the year. From July to November each year the sick-rate from malaria is considerable; hitherto the diagnosis has been made on clinical grounds, and quinine has been the usual treatment. In January and February each year one or two cases of kala-azar have been diagnosed. In most instances the diagnosis has been made on clinical grounds, following the failure to obtain any improvement with quinine; the Sister in charge of the dispensary is familiar with the aldehyde test, but usually contrives to make a diagnosis before this test becomes positive. In the Carmichael Hospital for Tropical Diseases the diagnosis is confirmed by spleen puncture in every case.

We have never been able to trace any hut or any cases-to-case infection; in fact the kala-azar history of the settlement is very similar to that of any Bengal village, except that the incidence is more or less continuous and not subject to the usual waves. This is probably because there is a continual supply of fresh susceptible material, as new children are introduced from various parts of the country. About half the boys in the settlement are adopted as infants and remain in the settlement until they reach manhood; of these there are 3 or 4 new arrivals each year. The remainder came at the age of about 9 years and remain until they are about 15; of these there are 6 or 7 new arrivals each year.

Last year it was reported that there was an exceptional amount of malaria during the months of August and July, and we decided to investigate this point. All the boys and most of the Indian women who help to look after the children were examined, and thick and thin films taken from each. Short notes on their histories, the sizes of their spleens and the results of the blood examination were entered in a register kept especially for the purpose.

At this examination, during the third week in September, out of 111 persons 18 were found to have enlarged spleens; of these 7 were less than 10 years old, 6 were between 10 and 15, and 5 were 15 years or more. The result of the blood examinations were:—

Plasmodium falciparum trophozoites, 7.

P. falciparum crescents only, 2.

P. vivax trophozoites, 6.

That is to say 15, or about 14 per cent., showed malarial parasites.

Of the 111 persons, 12 have had kala-azar and been treated by us. Of these 10 had malaria, and 6 had an enlarged spleen.

In this part of Bengal the malarial season does not reach its height until November, so that it was obvious that a heavy malaria sick rate was to be expected. We, therefore, decided that this offered a favourable opportunity to carry out certain experiments which had been suggested by recent work in the treatment and prophylaxis of malaria.

(a) The work of James, Nicol, and Shute (1931) in London demonstrated that, given in large enough doses, Plasmochin will prevent the development of the malarial parasite in a person bitten by a malaria-infected mosquito. The doses they gave (0.02 gramme three times daily for seven days after subjection to the bite) are entirely impracticable for routine use in an endemic area where the whole population is daily at risk of being bitten by infected mosquitoes. The dose we settled upon was obviously a minimal one, but the cost of even this dose would not be a negligible factor were a large coolie force subjected to it. We gave a single dose of 0.01 gramme three times a week to boys of 12 or over, and half this amount to younger boys. We decided to give about half the boys this prophylactic course; actually, it was only given to 46.

(b) A large number of observers have shown that even in small doses Plasmochin rapidly clears malaria patients' blood of gametocytes. The possibility of turning to account this property of Plasmochin, and of carrying out anti-gametocyte treatment on a large scale in a community, thereby removing from the mosquitoes in the neighbourhood the source of infection, has also been appreciated as a new anti-malarial weapon by certain malariologists. The recent experiments of Knowles and Das Gupta (1930) showed that a total dose of 0.06 gramme, given in doses of 0.01

gramme twice daily for three days, after an ordinary course of quinine was invariably followed by the disappearance of all the gametocytes; we therefore adopted this dosage for older boys, giving doses of 0.005 gramme to the younger boys.

(c) Dr. O. Urchs, the expert representative of Bayer-Meister Lucius of Leverkusen, where Plasmochin was first produced and where as the result of recent experiments a new anti-malarial drug has been produced, kindly placed a considerable quantity of this new compound, Atebrin, at the disposal of the senior writer for purposes of testing its efficacy. The latter (Napier and Das Gupta, 1932) has already carried out a series of laboratory-controlled experiments with patients in hospital and it was considered that we had here an opportunity of carrying out a field experiment with this drug. The dosage adopted was the same as that of the hospital experiment, namely, one tablet (0.1 gramme) three times daily for four days, for boys of 12 or over and half a tablet for younger children. The routine procedure adopted was as follows:—

Every person suffering from malaria was admitted to the hospital in the settlement; blood films, both thick and thin, were taken immediately by one of the writers who resides in, and is in medical charge of, the settlement, and if the patient was considered to be seriously ill, or if the condition was clinically typical malaria, treatment was commenced immediately; if not, the result of the blood examination was awaited. The films were sent to the School of Tropical Medicine and examined, hurriedly at first, in order that in the case of a heavy infection there should be no undue delay, and later, at leisure, in order to confirm the original diagnosis. The patient was put on Atebrin for four days and then Plasmochin for three days (dosage as mentioned above); after this both thick and thin blood films were again taken and examined carefully. The results of these three sets of experiments will be considered separately:

The result of the administration of 'prophylactic' Plasmochin

The administration of the Plasmochin was personally supervised by one of us (D. B.) for most of the period and was given regularly during this period, but in her absence, during part of October, the administration was not thus supervised and is known to have been irregular. A note was made regarding this irregular dosage but in view of the results obtained in this experiment this irregularity in a small proportion of the group does not assume any importance. The prophylactic Plasmochin was not given to patients who were actually under treatment for malaria, but after discharge from hospital they were again put on

the roster. The prophylactic Plasmochin was given from September 20th to December 21st.

Of the 46 persons on prophylactic Plasmochin, 26, or 57 per cent., suffered from malaria during the period of observation, i.e., September 13th to January 31st; of the remaining 65 persons, 24, or 37 per cent., suffered from malaria. Taking into consideration only the period during which, in view of the incubation period of malaria, the drug might be considered to take effect, that is, the months of October, November and December, the figures were 17, or 37 per cent., and 12, or 18 per cent., respectively. And, finally, if we separate the species, we see that during the three months 16, or 35 per cent., were infected by *P. falciparum*, in

the prophylactic group, and only 7, or 11 per cent., in the group which received no prophylactic Plasmochin, the figures for *P. vivax* being 3, or 6 per cent., and 6, or 9 per cent., respectively. These results are shown in table I.

We were prepared to find that this comparatively small dosage of Plasmochin gave no protection against malaria infection, but these figures, which seem to indicate the reverse effect, are very surprising; at the same time, though the numbers involved are small, the difference in the two sets of figures is so great that they cannot be dismissed as not being significant, it is, therefore, necessary to examine them carefully to see if a fallacy can be detected.

TABLE I
Showing results of 'prophylactic' Plasmochin

		Total malaria incidence	Outside prophylactic period	PROPHYLACTIC PERIOD			
				<i>P. falciparum</i>	<i>P. vivax</i>	Either species	
Prophylactic	Plasmochin = 46	Number	26	8	16	3	17*
		Percentage	57	17	35	6	37
No prophylactic	Plasmochin = 65	Number	24	12	7	6	12*
		Percentage	37	18	11	9	18

* Instances of double infection account for discrepancy.

TABLE II
'Prophylactic' Plasmochin in different age groups

Age group			Total	October to December	Outside period		Number in group	Number with malaria	Percentage with malaria
15 years or more.	Prophylactic Plasmochin No prophylactic Plasmochin	{ Malaria No malaria	4	2	2	{ 11	{ 31	9	29
			7	9	9				
		{ Malaria No malaria	5	2	3	{ 20			
			15	18	17				
10 years—under 15.	Prophylactic Plasmochin No prophylactic Plasmochin	{ Malaria No malaria	9	7	2	{ 17	{ 52	22	42
			8	10	15				
		{ Malaria No malaria	13	7	6	{ 35			
			22	28	29				
Less than 10 years.	Prophylactic Plasmochin No prophylactic Plasmochin	{ Malaria No malaria	13	8	4	{ 18	{ 28	19	68
			5	10	14				
		{ Malaria No malaria	6	3	3	{ 10			
			4	7	7				
All ages.	Prophylactic Plasmochin No prophylactic Plasmochin	{ Malaria No malaria	26	17	8	{ 46	{ 111	50	45
			20	29	38				
		{ Malaria No malaria	24	12	12	{ 65			
			41	53	53				

There were two possible fallacies, both associated with the populations of the two groups. The selection of the boys for prophylactic Plasmochin was more or less arbitrary. During the period a certain number of the boys went to their homes for a short holiday, between two and three weeks; those that were known to be going home were not selected, but no other factor was allowed to influence the selection.

The age factor.—It will be seen that this is an important factor. In table II we have divided the patients into three age groups (i) 15 years or older, (ii) ten years but under 15 years, and (iii) under ten years of age. It will be seen that there is a considerable difference in the incidence of malaria in these three groups, from 29 per cent. in group (i) to 68 per cent. in group (iii), and it will also be seen that 'prophylactic' Plasmochin was given in much greater proportion in the most heavily infected group, (iii). However, the predominance of malaria infections in the 'prophylactic' group is still apparent in each separate age group. Furthermore, looking at it another way, it will be seen from table I that the percentage of malaria infections occurring outside the prophylactic period was almost exactly equal in the two groups. On the whole, therefore, it does not seem probable that the age factor had much influence in bringing about this striking difference in the malaria incidence in the two groups.

The holiday factor.—Nearly all the boys that went away to their village homes; these villages are mostly malaria infected, but it is possible that they are not so heavily infected as the Behala settlement, and, furthermore, it is possible that a few of the boys may have been ill during their absence and have recovered before their return. However, it will be seen from table III that, if all those who went away for any reason at all during the period are excluded, an even more marked difference in the malaria incidence in the two groups exists.

TABLE III

		MALARIA THROUGHOUT WHOLE PERIOD		<i>P. falciparum</i> DURING PRO- PHYLACTIC PERIOD	
		Num- ber	Per- centage	Num- ber	Per- centage
Prophylactic Plasmochin	} 44	25	57	15	36
No prophylactic Plasmochin		8	36	2	9

Through a misunderstanding during October in the absence of the Sister some boys were given a few doses of quinine. As these were all but one amongst the prophylactic Plasmochin

group the only effect this mistake could have would be to reduce the malaria incidence in this group.

Discussion.—As far as *P. falciparum* infection is concerned there is no evidence that Plasmochin, in the doses in which it was given, has any prophylactic effect, and on the other hand there is some indication that the reverse is actually the case and that this drug either precipitates a malarial attack in an infected person or makes a malaria-free person more susceptible to infection.

When we commenced this investigation we were unaware that any observations regarding the provocative effect of small doses of Plasmodium had been made. The senior writer, in his paper with Dr. B. M. Das Gupta in this issue, noted that in one patient, who—because he had shown no asexual forms in his blood for some time and was afebrile—was at first given Plasmodium only, fever recurred and asexual forms appeared in the peripheral blood.

Recently, our attention has been drawn to the work of Fischer and Weise (1927) and Swellengrebel (1931) who have made similar observations.

The effect of the anti-gametocyte measures

It is scarcely conceivable that the malaria in the settlement could have been much more intense than it was this year. In previous years the blood of the patients has not been examined, so that the incidence of malaria is not known accurately, but the fever-sick rate was higher this year than last year. Though it is fairly obvious that no beneficial result followed the anti-gametocyte measure we adopted, this does not mean that in other circumstances similar measures will not be successful. There are many factors to be taken into consideration; in the first place, these measures were adopted much too late in the year and, secondly, it is probable that the proximity of malaria-infected dwellings, where it is not possible to institute these measures, make this method of malaria control valueless in this settlement.

No conclusions can be drawn from this experiment.

Results of the Atebrin and Plasmochin treatment

As we have already explained above, when the routine examination of the 111 residents in the settlement was carried out in September, 15 were found to harbour malarial parasites; most of these patients were suffering from fever at the time, but whether they were or not, they were treated as cases of malaria and given the routine course of Atebrin and Plasmochin (*vide supra*). Subsequently, only those who were suffering from fever had their blood examined.

Fifty patients had malaria; these had 61 attacks, 43 due to *P. falciparum* infection and

On December 16th another batch of 23 *A. stephensi* was fed on the same patient, the crescents being 160 per cubic millimetre. The mosquitoes were dissected as follows:—

The above notes we submit create a strong presumption that Atebrin administered to a patient suffering from malaria completely prevents the development in the mosquito of any

On	Number of <i>A. stephensi</i> dissected	Days after feeding	EXAMINATION OF	
			Stomachs	Salivary glands
7-1-32	2	22	Nil.	Nil.
8-1-32	5	23	Nil.	One mosquito showed very scanty infection.
9-1-32	5	24	One mosquito showed an oöcyst.	Nil.
11-1-32	5	26	Two showed oöcysts.	Nil.
16-1-32	6	31	One showed oöcysts.	The same mosquito showed scanty sporozoites.

Total percentage with development forms — $\frac{5}{23} = 22$ per cent.

On December 18th another batch of 9 *A. stephensi* were fed on the patient, who on the 19th had 120 crescents per cubic millimetre the result of the subsequent dissection being as follows:—

gametocyte from that human host, that considerable inhibition to development exists the day after the drug has been discontinued, and that the parasite resumes its developmental powers three days after the discontinuance.

6-1-32	4	19	Two mosquitoes showed oöcysts.	All showed scanty infection.
7-1-32	2	20	Two with oöcysts	Two with scanty infection.
19-1-32	3	32	One with oöcysts	All with scanty infection.

Total percentage with development forms—100 per cent.

ON THE FAILURE OF *TODDALIA ACULEATA* IN THE TREATMENT OF MALARIA

By RAI BAHADUR B. N. VYAS, M.B.

and

B. B. BHATIA, M.D., M.R.C.P.

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Toddalia aculeata (Syn. *T. asiatica*, *T. rubicaulis*, *T. nitida* and *Scopolia aculeata*) is a climbing shrub of natural order Rutacea. Vernacular, Sanskrit, *kanchana*; Hindi, *kanj*; *dahan lahan* (Rajputana); *meinkara* (Nepal); *saphijirik* (Lepcha); *melkaranai kandvi* (Tamil); *konda-kathinda* (Telugu); *jangli-kali-mirchi* (Bombay); *kudur-miris* (Ceylon).

It grows in sub-tropical climates of India, Java, Sumatra, China, etc. It is a large scandent shrub with branches covered with prickles, on broad corky cones; the leaflets are crenulate, varying in length from $1\frac{1}{2}$ to 4 inches, the flowers small, cream coloured in axillary panicles, longer than the petiole; the calyx is glandular, petals—five, imbricate, stamens—not exceeding five, ovary—five-celled, style—short, stigma—five-lobed, and ovules—two superposed in each cell. The root is woody and in cylindrical flexuose pieces, from $\frac{1}{2}$ to 2 inches in

diameter. The root bark is about $\frac{1}{12}$ of an inch thick and consists of a soft yellow corky external layer, wrinkled longitudinally, a thin yellow layer and a firm brown middle cortical layer.

Chemical composition

The bark contains a resin, an essential oil resembling oil of citron in flavour, and a bitter principle identical with berberine.

The present investigation was undertaken because of the alleged anti-malarial properties of its root bark in the indigenous system of medicine, and of the good results in malaria reported by earlier investigators. Rheede (Kirtikar and Basu, 1918), who gave an extensive trial to this drug, stated that as an anti-periodic and antipyretic, it was equal, if not superior, to quinine and other alkaloids of cinchona. In his experience, even in obstinate cases of malaria where quinine or arsenic had failed, favourable results followed the use of this drug. Dr. Bidie of Madras found it a valuable tonic in debility after malaria fever and in convalescence from exhausting diseases. This result was confirmed by Surgeon Major Kirtikar in cases of malaria cachexia. An infusion of the bark of this shrub was tried in several mild

(2) The second attack of ptomaine poisoning appeared to immunise the patient as the symptoms were not nearly so severe.

(3) Ten to 15 grains of quinine were given daily throughout without any ill-effects. The symptoms were very closely watched.

(4) There were only two attacks of hæmoglobinuria which soon cleared with the treatment. The jaundice too cleared very rapidly in 2 to 3 days.

(5) The temperature was never higher than 100°F. There was no definite rigor at the commencement of the attack.

(6) Absence of local pain over the liver and the spleen. The liver was enlarged slightly, but the spleen was not.

BILOCULAR HYDROCELE SIMULATING HERNIA AND HYDROCELE

By BRIJBHUSHAN LAKHOTI, L.M.S., P.M.S.

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(United Provinces)

B. D. T., aged about 40 years, was admitted into hospital on the 22nd October, 1931, for swellings in the left scrotum and lower part of abdomen. The duration of the swelling in the scrotum was about 2 years and that in the abdomen was about 4 months. He stated that when he was about 10 or 12 years of age his *Guru* (religious preceptor) instructed him to push both his testicles up into the abdomen, as by doing so he would avoid any sexual desire; since then he has done this every day after the morning bath, as his testicles come down into the scrotum every day when he gets out of bed in the morning. The swelling in the scrotum and the abdomen gradually increased. He had no difficulty in passing urine and no history of injury. On examination, a large rounded painful swelling was found in the scrotum on the left side; it was elastic, fluctuating and dull on percussion, the cord could not be felt, the testicle not readily felt, it was irreducible, there was no impulse on coughing, and the lower part only was translucent. The swelling in the lower part of abdomen, above and below the umbilicus, was 5 inches by 5 inches, it was quite dull, the skin freely moved over it, it was situated in the middle line, but was more prominent on the left side, there was a slight sensation of thrill felt in it when the swelling below in the scrotum was pressed and so appeared to be connected with it.

He was operated upon by Major J. B. Vaidya, I.M.S., Civil Surgeon, Gorakhpur. An incision, about 4½ inches long, was made from just above the external abdominal ring to the upper part of scrotum; the tunica vaginalis was isolated from the surrounding structures, and the cavity opened. Fluid escaped and the swelling in the abdomen also disappeared. The sac was then turned inside out, and stitched on to the back of epididymis and testis. The patient was discharged cured.

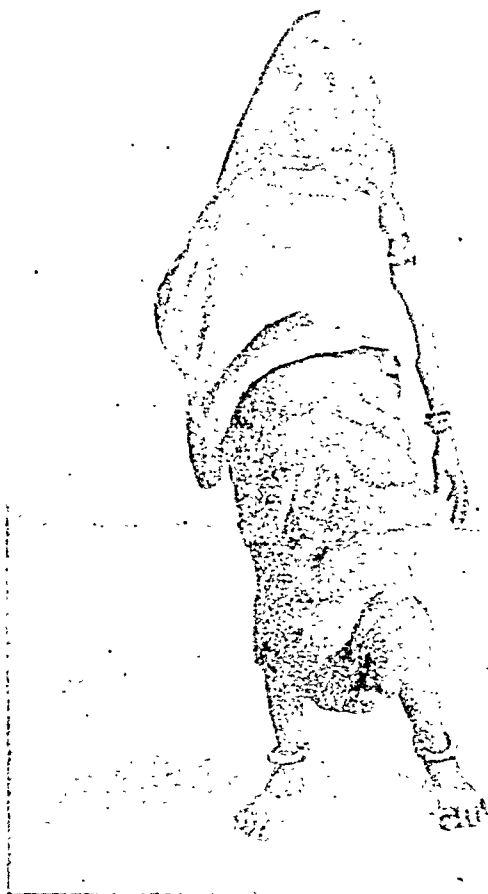
A CASE OF DERMATOLYSIS

By P. SHARMA, M.B., B.S.

Medical Department, Dhar State, Dhar, Central India

K. B., Hindu female, married, potter (Kumbar) by caste, aged 25 years, was admitted into the King Edward Memorial Hospital in October, 1929. She complained of heavy folds of skin hanging loose from

her thighs, the weight and the bulk of which greatly interfered with walking and other movements of the hip and knee joints.



Front view of growth from the left side.

History.—The patient was married at the age of 11 years. Two years after her marriage she had an attack of fever which lasted one month. During this period she noticed the skin from the front of the left thigh started dropping; since then the growth has continued to increase both in dimension and weight. Some time after, a similar growth appeared on the other side. The size of these growths has enormously increased by now, interfering with the movements of the lower extremities.

Menstruation.—The patient started menstruating one year after the marriage. For some months it was regular, but a few months before the appearance of the growth she started menstruating once in every two months. For the last two years before the admission into the hospital, menstruation ceased.

Pregnancies.—None. She lived with her husband 3 years after the onset of the menstrual period.

Vaginal examination.—No abnormality detected.

Effect of the growths.—The prolonged and gradual difficulty in the movements of the limbs and the pelvis has wrought changes in the lumbar vertebrae producing kyphosis and partial scoliosis.

Character of the growths.—They extended from the buttocks behind down to the lower third of the thigh in a sort of line, the heavy folds hanging loose from their origin on all sides. The growth has a tendency

gradually to involve most of the healthy skin. The growth starts with the thinning out of a small somewhat circular area of the skin. The thinned-out skin gradually stretches and begins to hang loose. These areas are accompanied by pigmented lines. Then similar areas are involved and then coalesce. The distance between the hair follicles is greatly increased and hair becomes thick. The hanging portion later on takes more or less the form of an apron. In the recesses of the folds the area is traversed by superficial ulcers which are not painful. The folds are devoid of the sense of touch. Microscopic examination of a section



Back view of growth of left thigh, showing the scar at site of removal of the growth from the right side.

from the growth reveals fibrous tissue interspersed with big blood vessels. It can therefore be called a diffuse fibroma. From the hanging of the skin the condition is named dermatolysis.

Operation.—The success of the operation depends upon the healthy skin available for bringing together and suturing the cut margins. In this case the growth from the right extremity was removed at one sitting commencing from the median line behind the gluteal region down to the junction of the middle and the lower third of the thigh laterally (*vide* photograph). The growth is traversed by big blood vessels. The growth in the left extremity could not be removed for the following reasons:—

(a) Only a small strip, about 2 inches wide, of healthy skin was available, (b) after removal, laying bare of such an extensive area would have caused great shock, and (c) skin grafting was not possible.

The photographs show the size of the growth of the left thigh after removal of the right one, both in front and behind.

Points of interest

(1) The ætiology of the disease is unknown. In the present case some relation exists with the fever.

(2) Irregularity and consequent cessation of menstruation.

(3) The rarity of the disease. During my 10 years stay in this part of the country I have seen only this case.

(4) The mistake in diagnosis of this disease commonly occurs on account of (a) its resemblance to elephantiasis (filarial disease), (b) the rarity of the disease, (c) the inaccessibility of any literature on the subject. I have never seen the condition described, but Colonel Acton, Director of the Calcutta School of Tropical Medicine, refers to it in his lectures. He calls this condition 'diffuse fibromatosis'.

(5) The disease may involve any part of the body. No other tissue except the skin is involved in the growth.

(6) The growth has not recurred in the area (after removal).

(7) The weight of the growth removed from the right leg is about 14 pounds.

I thank Colonel Acton for showing me the photographs and explaining the condition, and Dr. G. Panja for helping in the microscopic examination of the section from the growth.

Special Articles

A PRACTICAL NOTE ON THE CYANIDE FUMIGATION OF SHIPS

By C. L. BILDERBECK, M.A., M.B., D.P.H.
MAJOR, I.M.S.

Bombay

IN view of the fact that fumigation of ships, etc., with hydrocyanic gas has not, so far as I am aware, been introduced into India up to the present, this note has been compiled in the hope that it may be of some practical service to those interested in such matters.

Through the kindness of Col. P. G. Stock, C.B., C.B.E., and Dr. M. T. Morgan of the Ministry of Health, in arranging an introduction to Dr. C. F. White, Medical Officer of Health, Port of London, I visited the latter on September 15th and 16th and called on the Fumigation Services Co. of Barking, who specialise in the use of liquid hydrocyanic acid gas, and on the London Fumigation Co., Ltd., of Lloyd's Avenue, E.C.3, the English agents for 'Zyklon', both of whom were most helpful in every way and were good enough to arrange demonstrations of their methods of fumigation.

On October 2nd Dr. White also very kindly introduced me to Mr. J. D. Hamer, F.I.C., official chemist to the Orient Line, by whose arrangement I attended the fumigation of the R. M. S. 'Orama' at Tilbury Docks, which was carried out by means of the 'Zyklon' and 'Galardi' methods. To Mr. Hamer I am more than grateful for all his kindness and hospitality in providing so interesting an experience, and I have also to thank him for much of the information embodied in the following note.

It should firstly be noted that, according to the Port of London Sanitary Annual Report for 1930, out of 233 fumigations performed only 51 were done with cyanide, sulphur screens being still in favour there, as, I believe, is also the case in the Dutch Netherlands, though there is little doubt but that, given the necessary reliable and trained personnel, cyanide fumigation will soon supplant the older methods, and it is noteworthy in the same report that the numbers of cyanide fumigations increased towards the end of the year under review.

Fumigation by liquid hydrocyanic acid

The cost of apparatus is £10 per set; these consist of rubber tubing fitted with copper nozzle end-pieces, or sets of tubes screwing together in sections fitted with lateral off-shoots and rose-sprays for doing long corridors with rooms or other sections opening thereinto. The gas is supplied under pressure in liquid form in large 75-pound cylinders costing 1 dollar per pound. From these it is decanted into smaller portable 20-pound canisters called 'applicators', the pressure in which is kept up and regulated to 50-pounds per square inch by means of foot- or hand-pumps, much on the same principle as in anti-mosquito oil-sprayers, and the required quantities per cubic space to be fumigated are discharged by means of finger pressure releases attached to the delivery nozzles, the quantities of gas released being regulated by weighing the canister with a small portable hook spring-balance. The applicators hold about 10 pounds of liquid hydrocyanic acid, and 60 grammes or 2 ounces liquid hydrocyanic acid per 1,000 cubic feet are released to obtain the necessary 0.2 per cent. hydrocyanic acid gas lethal to rats, fleas, etc.

It is suggested that the possible objections to this form of fumigation in India are:—

(a) Liquid hydrocyanic acid may polymerize at 72°F., possibly becoming explosive, and so would need to be kept in refrigeration both in the large cylinders, and in the portable canisters.

(b) The worker activating the sprayer must be relied upon to see by constant weighing of his canisters that the proper amount of hydrocyanic acid has been released therefrom.

(c) If pumping and tubing are not properly connected fatal leakage may occur at the joints.

The gas mask advocated by the Fumigation Services Company costs £3, and is in my opinion not altogether suitable for the East as part must be introduced inside the mouth thus precluding speech; a nose clip must be worn, as only the mouth is covered; there are valves in the mouthpiece; and the tube passing round the neck to the back is cumbersome and apt to catch on projections, thereby perhaps displacing the mask from the face. An advantage however is that the eyes being uncovered vision is unimpeded.

The disadvantages would appear to make this method impracticable in India, though the actual process of spraying liquid hydrocyanic acid has the advantage of being quicker, cleaner, and of leaving neither stain nor residue to be cleaned up after fumigation.

It is not therefore proposed to discuss this particular product further in this note.

(b) Fumigation by Zyklon, Etox, etc.

Brochures regarding the proceedings connected with the London Fumigation Company's products can be obtained from the Company's offices, so this note will be devoted to practical observations made when accompanying Mr. Hamer and his gang—of the Orient Line—who, according to information received from two separate sources, cannot be surpassed anywhere in the world for the care and thoroughness of their procedure, and, after seeing them in action, I can well believe it.

(a) GENERAL

(1) Personnel and responsibility

It should firstly be noted that neither in London, Liverpool, nor Bristol, nor, I believe, in any port in the United Kingdom, does the port sanitary authority accept responsibility for the procedure involved in fumigation other than to verify that the proper amounts of fumigant are used per capacity certified by the ship's authorities. The entire responsibility for preparing and clearing the ship, for the actual fumigation, for safeguards, accidents, etc., lies with the shipping and fumigation companies, and their officers. The Orient Co. fumigation gang consists of six specially trained sailors under Mr. Hamer, the company's official chemist.

This gang operates on ships up to 20,000 tons, the men working in pairs. The thing that struck me most when watching them at work was the keen, unfurried, and methodical yet swift way in which they worked, and the fact that, at whatever time they were asked as to the whereabouts of other members of the gang, such was their co-operation that they could always give the exact information required. This should be noted by those considering the

adoption of cyanide fumigation as being a point of considerable importance. The men are considered to be on duty throughout the procedure, and are paid 18 pence per hour *plus* 50 per cent. special duty pay, and double for overtime, holidays, Sundays, etc.

(2) *Toxic susceptibility, etc.*

Men suffering from cuts, and sores (such as specific, or traumatic) should not be employed, nor should men with perforated ear-drums, nor alcoholics, as all these seem to be more susceptible to the toxic effects of the gas, which can actually be absorbed through the unbroken skin if sufficiently long exposure is allowed; hence fumigators should not expose themselves for too long a period without giving themselves an airing.

The consumption of glucose appears to be beneficial to workers and the gang is accustomed to eating sweets in consequence.

It is also stated that spirits should not be taken either before or after carrying out a cyanide fumigation.

(b) PREPARATION OF SHIP FOR FUMIGATION

(1) *Warning and guards*

A special flag is flown at the mast-head, *viz*, a yellow flag with a black border, and black skull and cross bones in the centre. Danger notices in red are placed on the quay, and both at the top and at the bottom of the gangways (which latter should be reduced to one only) stating that the ship is under fumigation and that nobody but fumigation and port sanitary officials are allowed on board. Cross-chains or other barriers are also placed at the foot of the gangway, where also watchers are on duty throughout proceedings. In addition to these precautions, between the time of completion of the actual gas release and the hour of opening-up, at least two of the gang are on duty on the open deck at the top of the gangway, and the whole gang are considered to be on duty until the ship is declared safe and free for re-occupation.

(2) *Lighting*

The ship's engineer and electrician are allowed under surveillance to remain on board to work the auxilliary lighting plant to enable the gang to perform their work between decks, but are seen off the ship at the last when only the ship's officers' quarters and the lighting-plant rooms themselves remain to be done.

(3) *Gas masks*

The London Fumigation Co.'s mask is the best I have hitherto seen. This model costs £3-15-8,—and consists of a leather face-piece like a fencing mask, enclosing eyes, mouth, and nose. It fastens by a strap which contains metal springs, and passes round behind the back of the head, leaving the ears free, so that conversation, though muffled, is not precluded.

No valves or outside tubes are present, and no part need be introduced inside the mouth.

Over the mouth is a circular screw-fitting into which the respirator, having been taken from its hermetically sealed tin, is screwed.

In applying it, the chin should be pushed well down into the mask, which is then strapped round the back of the head. A hand is then placed over the mouth-hole and the wearer is made to inspire and expire to see whether air can be sucked in or driven out at any leaking point around the mask. Having ascertained that this is not the case and that the mask fits properly, the respirator is screwed into the mouth-hole, and the mask is ready for use. It is stated that these masks will stop up to 1.0 per cent. hydrocyanic acid gas which ensures safety for most purposes. These masks will last for about an hour if packed as these are reported to be—with a mixture of charcoal, alkali and pumice. When a partly-used mask is put on in the open air the first few inspirations may be tainted with the smell of hydrocyanic acid, but this should pass off. If however when working in the gas, the smell persists or inspiration becomes laboured, the operator should get out at once into the open air and refit another respirator. These masks are stated to last about 5 times longer than the plain charcoal masks.

Specially-prepared air-insulated mica discs are fitted in the eye-holes, which preclude dimming or dewing from sweat condensation, etc.

Gas-masks are worn by operators from the time they commence to open tins of Zyklon up to the end of the first test for safety, and thereafter are kept handy round the neck until the ship is declared free from gas and safe for re-occupation.

(4) *Preparation of ship, etc.*

This is performed as in all other fumigations. All internal doors, compartments, and holds opening into each other are opened up. Mattresses, pillows, etc., in mass are piled in staggered formation or on edge, to facilitate gas penetration. All drawers, cupboards, butterfly-hatches, etc., must be opened up. A preliminary study and reconnaissance of the ship by the fumigation gang having been made, with instruction in the working of bulkheads, water-tight doors, lighting plant, etc., a plan of action is drawn up, sections being serially numbered, as regards the route to be taken by the gang in cyanide distribution; the main exits to the decks are left open, and all other external doors are pasted up with strip-paper and paste; holds are battened down with light battens removable by hand, and ventilators (whether draught or mechanical fans) are closed by canvas hoods well tied round the apertures. In oil burning and motor-ships the funnels must also be covered, as these, having no dampers, act also as ventilators. Water-tight doors are

closed when required to isolate in sections, and all means of gas-escape such as pipe-castings, etc., are sealed, not forgetting scupper-drains, which, by disuse, may have become unsealed and be overlooked. All ports are screwed down but only by hand so as to avoid delay when opening up through having to use tools. Deck windows are closed, left unfastened (to facilitate opening from outside) and then pasted over with paper glazed on both sides. Strips of canvas, painted on both sides, are laid at intervals along corridors, in saloons and on the bottom of holds to receive the contents of Zyklon tins, whereby to obviate possible staining of carpets, linoleum, etc., and also to facilitate cleaning up. Alternatively, sheets of brown paper can be used for this purpose, but the former last a long time and make equipment more complete. Water-bottles, tanks of all sorts, and bilges should be emptied out, as water will absorb the gas, especially if cold, with later slow evolution, particularly if thereafter the temperature thereof becomes raised.

(c) Gassing

For deratisation the U. S. A. regulations demand a concentration of 0.2 per cent. hydrocyanic acid for 2 hours followed by a minimum period of 1 hour for clearance. The same amount of gas will be required for empty and loaded ships, as penetration and absorption occur in the latter, especially where there is much condensation-moisture, or sweating. Hence loaded holds will need to be under gas for about 4 hours instead of only two hours as in the case of empty holds. For further information regarding the gassing of ships in cargo the reader is directed to the references at the end of this note. At ordinary concentrations, foodstuffs, tea, tobacco, and vegetables, etc., are unaffected by hydrocyanic acid if proper aeration is given, but heavier concentrations such as 10 ounces per 1,000 cubic feet or 1.0 per cent. hydrocyanic acid, will affect delicate vegetables, such as lettuce, sterilize eggs, and stop seed from germinating.

Fleas are killed before the rats die. For other vermin, bugs, lice, cockroaches, etc., an increased concentration is used, but even then some cockroach egg-pouches appear to be immune and will hatch out after fumigation; hence refumigation may be needed a month later. Bug ova however seem to absorb gas and are destroyed.

It may be mentioned here that hens' eggs similarly absorb hydrocyanic acid, lose their capacity of hatching, and should be destroyed if subjected to fumigation. According to Hamer, cockroaches themselves require 0.5 per cent. for 20 hours or 0.7 per cent. for 8 hours for destruction. Ants take longer and need an exposure of 1.0 per cent. for 20 hours, and a concentration of 0.5 per cent. for 6 hours is required for bugs, etc. Williams found that

cockroaches need 5 times the dose lethal for rats, *viz*, 300 grammes, (10 ounces) of hydrocyanic acid per 1,000 cubic feet or 1.0 per cent. for 2 hours. As the use of such a concentration would increase the approximate cost of fumigation materials from 40 dollars (say Rs. 110) to 160-200 dollars (or Rs. 550), the New York quarantine station includes such intensive fumigation of the superstructure alone, at an increase of only 10 dollars—say Rs. 135 for the total cost of fumigation materials.

Zyklon consists of plaster of Paris, diatomite, or kieselguhr—a greyish chalky diatomaceous earth, impregnated with liquid hydrocyanic acid, so that about 2½ kilogrammes contain 1 kilogramme of hydrocyanic acid, which is sufficient for the fumigation of 17,000 cubic feet at an approximate concentration of 0.2 per cent. It is supplied in 40-ounce tins equivalent approximately therefore to 6,000 cubic feet space to be fumigated, and also is made up in smaller tins of 4 and 16 ounces and is manufactured for the London Fumigation Co. in the form of:—

(a) *gravel*, which is easy to pour out in the thin layer necessary to ensure rapid and complete evolution of gas;

(b) *discoids* each representing ½ ounce hydrocyanic acid and therefore useful for fumigating small sections. These are made of wood pulp or other absorbent material. They resemble Bath-Oliver biscuits and are very convenient to handle, but have the disadvantage of sticking against the jagged edges of tins after the latter have been punched open, but are easy to distribute and to clean up after fumigation. Moreover they are stated to retain the lacrymatory warning gas longer than the other forms of Zyklon which makes them safer in use, though operators should work to the benzidine test alone;

(c) *small squares* like thin cheese biscuits, which overcome the disadvantage of (b).

The liquid hydrocyanic acid gas used in Zyklon is stabilized with acetic acid, or with chloro-carbonic acid ester, and contains a lacrymator—chloropierin—up to about 5 per cent., or ethyl-brom-acetate in the proportion of about 5-10 per cent.

In rare instances, a tin of Zyklon, on being opened, may be found to have polymerized. This is recognised by the fact that the contents have turned black and such tins should of course be discarded. In the East therefore consignments of fumigation materials should preferably be regulated to ensure the shortest possible storage before use. It should be noted, however, that a consignment of Zyklon has been lying in Java now for nearly a year without any signs of deterioration. The tins are strongly made and from all accounts have been found safe for transport.

'Galardi' is another convenient form of cyanide, which is stated to be suitable for use

in the East by virtue of its being specially stabilized with acetic acid and therefore free from the risk of polymerization. It is a French patent, made by the Imperial Chemical Industries, Ltd., for Mr. H. W. Seymour, of Chiswell House, Finsbury Pavement, London, E.C.2, the sole agents therefor in the United Kingdom. This liquid hydrocyanic acid preparation is put up in $\frac{1}{2}$ kilogramme, crown-corked bottles, packed in partitioned wicker baskets or in 1 and 3 kilogrammes steel cylinders. Being stabilized by a patent process, it is stated that Galardi has been kept without deterioration for as long as 6 months at 50–55°C., and for more than a year at 50°C., (=122°F.), which should satisfy most requirements in the East; an additional advantage of this preparation is that it leaves no residue to be cleared up. It is claimed also that the gas itself clears more quickly than is the case with other preparations, for liquid hydrocyanic acid gives an immediate maximum concentration of gas whereas the solid preparations such as Zyklon may take $\frac{1}{2}$ –1 hour to evolve fully. Galardi moreover is quickly distributed—so much so that the Berengaria (52,000 tons) has been put under gas in 60 minutes, the Aquitania (45,000 tons) in 50 minutes, and the Carinthia (20,000 tons) in 28 minutes only. This liquid volatilizes into gas very rapidly so is particularly suitable for pouring down ventilator-funnels into holds, engine rooms, etc., where it vaporizes before reaching the bottom thus obviating damage to paint work, etc. Modifications in procedure in respect of the use of this preparation as opposed to Zyklon will be noted hereafter in brackets.

Procedure.—The plan of action and allocation of necessary quantities of hydrocyanic acid to different parts of the ship having been decided, distribution mats or paper are laid down along corridors or in rooms, etc., to receive the Zyklon. The gang then test and adjust their gas-masks, and 2 men begin to open the Zyklon tins out on deck to leeward.

At once after opening. Ballooning of cap by gas.

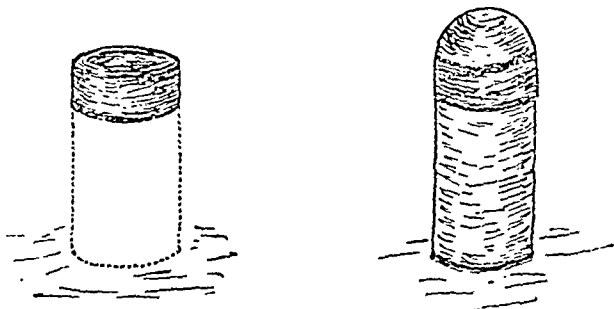


Fig. 1.—Zyklon tins, after punching open and capping.

For this a special punching-out machine, having 3 guillotine cutters arranged on a circular bit, is operated by one man by means of

a pump-handle arm at the rate of about 15–20 per minute.

As fast as he opens them—completely cutting out the lids—another operator caps the tins with closely-fitting circular rubber caps,—previously tested to ensure that no cracks or leaks are present as the result of previous tearing on the jagged tin edges, etc.

Owing to the short life of rubber in the East, these caps will have to be very carefully preserved and inspected before use out here.

Consequent upon the ensuing evolution of gas, ballooning of these caps soon commences, taking about half an hour at 63°F., and probably about 10–15 minutes in the East where rapidity in this part of the procedure will be essential. Alternatively the punching-out machine could be moved from one part of the deck to the other and distribution done section by section instead of doing all sections at one time before commencing to tip. If, in the process of opening and capping tins, one of the latter gets overturned, it should rapidly be swept to leeward;—operators should on no account waste time and endanger their own lives by stooping over it to collect the contents.

As fast as the tins are opened and capped, the other members of the gang fetch and carry off to place them, still fully capped, alongside holds, or on the mats prepared in saloons, alley-ways, etc.—ready for tipping. Such carrying operators, when picking up tins, should rapidly test each tin to see that the caps have been properly fitted on by the opening-and-capping operators.

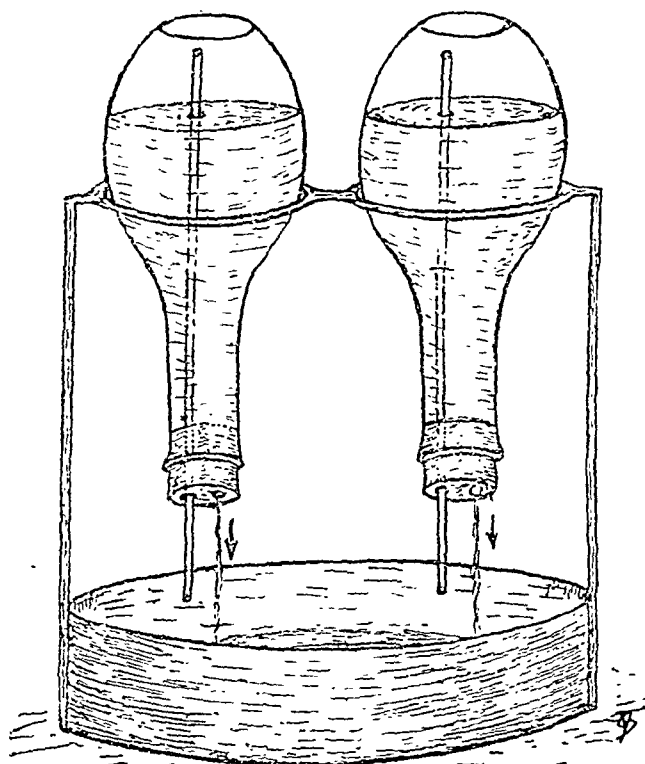


Fig. 2.—Galardi being discharged into container.

When all necessary tins are reported as having been opened, capped, and placed in position ready for spreading, the actual fumigation commences at a given signal.

In the case of Galardi there is no preliminary opening and capping, but bottles are placed ready alongside containers—2 bottles per container—together with two rubber bungs, in each of which there are two holes one of which latter is fitted with a long tube for air entry when fitted into uncorked bottles.

Working deliberately from below upwards towards the deck and up-wind, the men rapidly uncap the tins, and pour out the contents on the mats or brown paper spread for the purpose, leaving tins and caps to be collected after the final opening up. Spreading should be done as thinly as possible, as when applied thickly Zyklon can retain as much as 4-10 per cent. hydrocyanic acid after 24 hours though usually overnight aeration will ensure complete clearance.

In the case of Galardi the operator rapidly levers off the crown-cork of each bottle, fits the rubber bung into the neck and inverts the bottle into the container, as in the diagram:—

The Orient Line fumigation gang dispense with the rubber bungs and tubes, merely opening the bottles and inverting into rings or tripods set in containers. In this way they can handle as many as 400 bottles in 50 minutes, but, as the gas is presumably thereby released more rapidly than it is when bungs and tubes are used, it is suggested that the former procedure should only be followed by a highly-trained and swiftly-working gang.

By pre-arranged plan the gang works section by section in numbered sequence towards the doors left open for final exit, which are thereafter also pasted-up. Superstructure and engine rooms are left till the last, the latter being done by pouring Galardi down one of the ventilation funnels, the canvas covers of which are left loose for this purpose, and afterwards tied tightly around as already done in the case of all others.

Emptying tins directly on mattresses, sofas, or other thickly-padded articles must be avoided, as penetration occurs with later slow evolution, which has been known to result in fatality as the result of persons sleeping thereon before effective airing has been ensured. In the case of holds the canvas of the hatch coverings diagonally opposite each other are lifted up and the required amounts of Zyklon or Galardi are tipped in and the hatches well fastened down again. In doing this the necessary proportions should be guided into the 'tween decks' to ensure even distribution of the concentration of gas.

In practice it is found that Galardi or other liquid hydrocyanic acid is better than the solid forms for ships in cargo or ships offering good

cover for vermin, as penetration is more rapid and the necessary concentration is obtained sooner.

After distribution—during which all members of the gang must time their work so as to be sure that their co-workers have opportunity and time to converge on the main exits—the whole gang should collect on deck to windward to allow full ventilation against absorption of hydrocyanic acid into their clothes, overalls, etc., and thereafter should change clothes, and wash their hands and faces before taking their meals.

(d) Opening up

After the ship has been gassed for the requisite period—about 2 hours for rats, or 4 hours for other vermin according also to the concentration of gas used—opening up should start on the *lee-side* from the decks downwards, all operators wearing gas-masks and working in couples. The gas, being lighter than air, tends to clear as opening up continues. (It may be noted here however that Etox, the new fumigant to be referred to later, is *heavier* than air).

By opening up all hatches, funnels, and ventilator-covers, main doors, etc., and tearing through the paper covering windows which are then opened from outside, gradual aeration is commenced from the *lee-side*. If this work is started to windward, a dangerous rush of gas may occur on deck when the opening of the *lee-side* allows a sudden cross-current of air.

After saloons, cabins, etc., have been opened up, and hatches cleared and ventilated, the operating couples go below and deal similarly with port-holes and doors on the lower decks, and turn on all fans, etc., to assist clearance. On no account should they enter holds until the latter have been fully aerated by opening up. It should be noted here that a ship cannot always be considered clear after the one hour scheduled in the U. S. A. regulations, and that after free ventilation has been allowed for about this period, or longer if possible, the safety of the ship must be gauged by *test alone* and not by lacrymatory effect, for if lacrymatory gas is present in too small a percentage the effect may wear off before the hydrocyanic acid concentration has been reduced below the margin of safety. Moreover the penetration of lacrymatory gas is less than that of hydrocyanic acid, so that the latter may go on exuding long after the lacrymator has passed away. On passenger ships with much upholstery panelled rooms, etc., this is especially the case, as much hydrocyanic acid is absorbed—especially in the case of damp articles. In practice it is usually found that about 6 hours or somewhat less will be required for clearance or longer in calm humid dead weather, or when much absorption or penetration of gas has occurred, as in the case of ships in cargo.

(e) *Testing*

Of the three available methods there seems to be little doubt but that the benzidine-copper-acetate method is the best. The solution is made up by mixing equal parts of benzidine (1 gramme per litre) and copper acetate (3 grammes per litre), the solution being made up freshly, and carried by the tester in a small corked bottle or phial into which fresh white strips of Whatman's No. 40 filter paper are freely dipped, and held in the air as the tester tours the fumigated area.

It is obviously useless to commence testing until the ship has been under aeration for at least one hour and during the first test-tour gas-masks must be worn. Thereafter tours are made at intervals—*working to the test entirely*—until the ship can be certified as entirely free from gas, a period which averages out at about 6 hours. During such tours the tester watches the paper as he walks through the ship and should the paper commence to turn blue, he counts 8-10 seconds, and if in this period the colour becomes markedly blue, a dangerous concentration of about 0.01 per cent. is present, and it is as well to get out as soon as possible till further aeration has taken place. The strips of paper should be frequently changed as even if the slightest trace of hydrocyanic acid is in the air, the test paper in course of time will slowly take on the blue tint.

Special attention must be paid to lower drawers, small and large cupboards and ward-
with well-fitting doors, all of which
of course have been opened up before
ation started, but which, if overlooked,
be found to contain a dangerous concen-
ation of gas. Similarly boilers and tanks
tion repair, etc., must not be overlooked lest
to diff. in a dangerous concentration even
decided, on of the ship.

down along stores, etc., in the middle of the
the Zyklonide cabins with no port-holes may
their gas-m to clear, but clearance can be
Zyklon tins currents propelled along canvas

At once after all motor-fans run off the ship's
on deck or on the quay-side



Similarly in ships with much
or panelling, diffusion may
uld be taken to see that
ted for at least 24 hours.
and such other articles
ck, well shaken and
for 2 hours at the
ould not be slept

as the victim
aneously. In
a dry hard-
with a sinking
cutters arranged
followed by
ed by one man

muscular weakness of the knees and legs. If the victim is not immediately taken out into the open air, a sense of chest constriction, and unconsciousness or convulsions may ensue and go on to irregularity and ultimate paralysis of respiration and then heart, resulting in death.

Exposure for some time, with skin absorption of hydrocyanic acid, may result in a sensation of warmth all over the body with nausea, vomiting, headache, and perhaps convulsions. Skin absorption is stated to be greater in a damp humid atmosphere when perspiration is marked. Under such circumstances those handling solid hydrocyanic acid preparations can exercise the additional precaution of wearing rubber or paraffin-impregnated gloves. Heart irregularity and a sense of lassitude may be the sequelæ of poisoning and may last for a variable time, but recovery in acute poisoning is usually quick if the victim is early and vigorously treated. Operators must be taught to hold their breath or expire only, when they find themselves in difficulties and up against the time-factor. Coolness is of the greatest importance on such occasions. 'Get out of the gas, take a short breather, then out of the danger zone quietly and purposefully'—will produce a far less strain on the gassed system than will panic and violent action towards escape.

When smoking a cigarette or pipe, the taste of hydrocyanic acid seems to be appreciable even sooner than through the olfactory sense.

When hydrocyanic acid fumigation is being performed, an emergency first-aid station should always be at hand, as there is *no time to transport a victim to hospital*. In such an outfit there should be an oxygen cylinder—preferably containing also 7 per cent CO₂—either with a mask or intra-tracheal tube for administration.

The London Fumigation Co. also provides a compact little injection case, containing syringes boiled ready for use, adrenalin, and the accepted antidote, lobeline. In addition to such measures, artificial respiration is the main stand-by and must be administered, and be *persisted in* as long as the breathing remains irregular. Cessation of the heart means paralysis and the victims cannot then be expected to recover.

(g) *Clearing-up*

In the case of Zyklon this takes little time, as the mats or brown paper on which the Zyklon was distributed have merely to be collected with the residue. In the case of Galardi, the empty bottles and containers only have to be collected. All empty tins and rubber caps are also collected, and the latter should be washed clean, and tested to eliminate defective or torn ones. Paper in drawers, cupboards, etc., should be renewed as gas is absorbed thereby.

All residue should be swept up and dumped in the sea, for as much as 4 per cent. hydrocyanic acid may under certain conditions remain in the Zyklon after 4 hours' fumigation, and the residue may possibly reabsorb gas from the atmosphere. It is stated that with Zyklon the lacrymant outlasts the hydrocyanic acid and so is an indication of safety, but in humid atmospheres, such as those of Bombay, Rangoon, etc., the hydrocyanic acid is absorbed more than is the lacrymator so that the former survives the latter. Hence it cannot be too strongly emphasised that the benzidine test alone should be relied upon as the criterion of safety or otherwise.

Conclusion

From the foregoing it will be apparent that none but competent persons in command of a picked and well-trained fumigation gang should be allowed to perform cyanide fumigation; in fact a law should be framed prohibiting the unskilled use of cyanide, and licensing only competent persons as has already been done in other parts of the world. Another important factor to be noted is the necessity for avoiding commercialism in such fumigation lest unskilled labour or defective materials may be used in order to undercut the cost of fumigation by rival firms. In support of the above contention it may be noted here that in the United Kingdom in the past 18 months no less than 3 deaths, and more than 17 hospital cases have been occasioned in the use of hydrocyanic acid preparations other than those mentioned above, and in connection with this a letter, dated May 4th, 1931, addressed to the Editor, *Lloyd's List and Shipping Gazette* of May 5th may be quoted:—'The personal qualities required for the supervision of cyanide fumigation are of far more importance than any routine technical knowledge. The lowest price which undertakes to obtain the certificate, irrespective of other conditions, is the one, more often than not, which will be accepted, and those contractors who spare no expense where safety is concerned and who retain an experienced crew are gradually being driven out of the business by contractors who employ such labour as your correspondent cites, and who generally reduce safeguards, trusting to luck that no accident will occur. Cyanide fumigation is definitely a dangerous operation in the same way as mining, etc., only to be carried out by contractors with the highest sense of responsibility, and it cannot be made safe by any particular formulæ'. Similarly in the words of C. L. Williams of the U. S. A. Health Department to whose excellent articles reference has been made in compiling this note, 'handled by experts it (cyanide fumigation) is reasonably safe, but in the hands of the ignorant, reckless or careless, it is a frequent cause of fatal accidents as may be verified in the files of our daily newspapers'.

This note cannot be regarded as complete, without some reference to the new fumigant, Etox—also the product of the London Fumigation Co. This is a colourless liquid ethylene oxide, which can be discharged on the syphon principle by means of CO₂ gas under pressure, whereupon it immediately vaporizes. In concentrations higher than those used in fumigation this gas is explosive and inflammable, but can be rendered innocuous if diluted 1 in 7 with CO₂. This gas is heavier than air, and kills insects and such vermin, but is less poisonous to rats, etc., and human beings, whilst, so far as experiments have been carried out in respect of food-stuffs, it would appear that only the germinating power of seeds is destroyed, but otherwise, after aeration, it has been found to have no effect on food-stuffs, or vegetables, nor even on the taste of tobacco. The gas is released as a fine spray direct from steel cylinders by means of special nozzles fitted to the cylinder caps. The proportions to be used are 2 pounds ethylene oxide per 1,000 cubic feet or 1 pound only if diluted 1 in 7 with CO₂ gas which intensifies the lethal action of the former. The gas has great searching properties and penetration, and has been found very useful in clearing mills, etc., of moths and other insect life, even the weevil being entirely annihilated. The gas is reported to clear within an hour or two, so that whole mills and factories can be efficiently fumigated within 24 hours. In this connection also it may be mentioned that the fumigation of both ships and buildings is of importance in respect of the destruction of cockroaches and insect-life, for the former have experimentally been found to carry such pathogenic organisms as those of cholera, tuberculosis, leprosy and dysentery.

In conclusion it may again be emphasized that cyanide fumigation, though reasonably safe in reliable and responsible hands, is by no means a procedure to be undertaken lightly, and, as the work has to be performed systematically and rapidly, there is little chance of exercising any effective degree of supervision. Hence only the most intelligent and reliable personnel should be employed thereon.

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In this country a human pregnancy diagnosis station was established at this Institute some three years ago. It was devised for the provision of reliable service for the medical profession, and it is now used to such a degree that it is a self-supporting mechanism. From all over the country samples of urine to be tested are sent in, and in the course of the year about 800 reports are despatched within about ninety-six hours after receipt of the sample.

In 1927, Zondek and Aschheim demonstrated that similar effects could be produced by the use of the urine of pregnant cows, and since that time the work has been extended to include other animals of economic importance. During the past twelve months work has been in progress in this Institute to determine whether or not the pregnancy diagnosis test could be used in the case of the mare. A small herd of Shetland ponies formed a basis for preliminary investigation, while more extended results were made possible by personal contact with a large number of practising veterinarians, and by the circulation of a request that others should forward samples for diagnosis. The response to these requests has been good; samples have arrived from many parts of this country, from France, and India.

COLLECTION OF THE SAMPLE

The technique employed for collecting the urine is exceedingly simple. Normally, with the mares kept at the Institute, each sample was secured by the use of a catheter, employing a vaginal speculum in the smaller Shetland ponies. Otherwise, it is a simple matter to instruct a groom or horseman to collect some 50 c.c. in any clean wide-mouthed bottle, by watching for an opportunity when a mare passes urine on coming in from work or exercise.

The writers encountered a certain amount of prejudice against the use of a catheter in the pregnant mare by practitioners. Undoubtedly there may be some small risk of inducing abortion by careless catheterization of a heavily-pregnant mare, especially if the catheter is forced against, or even into, the os of the cervix. Such cases, however, apart from other considerations, require no diagnosis by biological test. We think it would be almost impossible to cause abortion by simple catheterizing during the earlier stages of pregnancy. It may be mentioned in passing that the ponies which were used in the earlier stages of this investigation were unbroken, most had only been haltered with difficulty, and several were only two years old, when they arrived. Apart from the occasional use of a twitch for a fractious animal, no restraint other than a halter was used, and no technical difficulty was ever encountered. Even after the passage of a catheter two or three times weekly for months at all stages of pregnancy, no complications whatever ensued. It should be pointed out, however, that occasionally when the bladder has been emptied just previously, it may be impossible to induce more than a few drops of urine to escape from the end of the catheter.

We have followed the rule of giving instructions for samples to be despatched as soon as practicable, though it appears probable that the hormone content of the urine does not rapidly depreciate, in view of the results obtained from samples from India, which were three to four weeks in transit. We prefer, however, to reserve a definite opinion on this point in the meantime. In a few instances we have made use of a rubber urine-collecting apparatus, specially devised for the purpose, where it was desirable to obtain a large amount of urine during the twenty-four hours.

BRIEF DESCRIPTION OF THE TEST

It was our experience here, and it has been found by many research workers, that the injection of untreated equine urine into mice was frequently followed by death. This urine has normally a high mucin content, and its protein content is considerable. In order not to vitiate the test, it is necessary to precipitate the protein bodies by adding a solution of sulphosalicylic acid; this also possesses some antiseptic action, and it has the advantage that it does not prejudice the activity of hormones

present. After filtration the sample is neutralized with sodium bicarbonate, using B. D. H. Universal Indicator.

It was early recognized that the diagnosis of pregnancy in the mare would best be determined by the effect upon the vaginal epithelium of the mouse. The effect upon the ovary, which would seem to be due to a different hormone, is in the case of the mare not nearly so intense and characteristic. At the present time, therefore, the test which is used is that which refers only to the induced cornification of the vaginal epithelium.

To obviate the possibility of any stimulation which the injected urine might have upon the mouse's own ovaries, and which might result in hormone production by them, ovariectomy is performed upon each of the test animals, usually at the age of four to five weeks, and at least eight days previous to the commencement of the test. After a further period of rest lasting for a minimum of one week, to allow the vaginal epithelium, which may have undergone partial or complete cornification, time to return to normal, the mice may be used again and again until four to five months old.

For ordinary test, four mice are used. The total amounts of urine injected range from 1.2 c.c. in the first, to 3.0 c.c. in the fourth mouse; one-sixth of these amounts is given to each mouse night and morning for three successive days. On the fifth day after the commencement of the test, vaginal smears are made from each mouse, stained (Giemsa) and examined microscopically.

INTERPRETATION OF RESULTS

The injection of œstrus-inducing hormone into ovariectomized mice induces those vaginal changes which are associated with œstrus in the mouse. During the œstral cycle in the mouse there is a fluctuation in size of the uterus and vagina, and a change in the vaginal epithelium. During the rest or diœstrus stage the uterus is small and contracted, during pro-œstrus an increase in size, due to the accumulation of fluid, takes place, reaching its maximum during œstrus, while subsequently, in metœstrus, regression to normal occurs.

The cells of the vaginal epithelium during diœstrus are nucleated and cuboid, and stain well, while mixed with them are a certain number of leucocytes. At the beginning of pro-œstrus, only typical nucleated epithelial cells are found, and these change to cornified cells as œstrus approaches. At the height of œstrus only cornified cells can normally be demonstrated in a vaginal smear. Leucocytic invasion occurs as œstrus passes into metœstrus, at which stage a large number of leucocytes occupy the smear. Subsequently, cubical nucleated cells appear as the diœstrus stage is once more reached, the leucocytes gradually diminishing in numbers.

For the purposes of the test under discussion, only a fully cornified vaginal epithelium is regarded as evidence of a positive reaction. Incomplete cornification may readily result from the injection of urine from a mare which is non-pregnant, but which was in one or other phase of the œstrus cycle herself when the urine was taken.

FLUCTUATIONS OF HORMONE CONCENTRATION

Undiluted urine which had been detoxicated and neutralized, and which, when injected in the appropriate amounts into each of four mice, gave cornification of the vaginal smear in each, was considered at first to have come from a pregnant mare, and the test was regarded as positive. The strength of the hormone which is required to give this reaction is 800 mouse units per litre of urine. We now know, however, that in certain cases enough œstrus-inducing hormone may be excreted in the equine urine during œstrus, or about the time of œstrus, to give this apparently positive reaction.

It is now our custom to dilute the urine by admixture of varying amounts of normal saline in order to reduce the concentration of the œstrus-inducing hormone, so that it will be possible to estimate the amount of M. U. per litre in a given sample. It is possible to

suggest that no concentration of less than 1,000 M. U. should be regarded as positive evidence of pregnancy, and that with concentrations of less than 1,000 M. U., but more than 800 M. U., a second sample should be tested after an interval of two to three weeks. The largest concentration from a known non-pregnant animal so far obtained has been 833 M. U.

Concentration of œstrus-inducing hormone rises as pregnancy proceeds. In one case, on the ninety-fifth day after service, the excretion was 2,500 M. U.; on the 104th day, 41,000; and by the 187th day, it amounted to over 160,000 M. U. per litre, although a considerable amount of variation has been encountered amongst different mares pregnant for the same length of time. After parturition the amount falls rapidly. From a level of 166,600 M. U. just prior to foaling, it dropped, in one of our mares, to 800 units by the thirty-fifth hour, while sixty-one hours after foaling less than 300 units could be demonstrated.

EARLIEST APPEARANCE OF ŒSTRUS-INDUCING HORMONE IN URINE

Specimens of urine from mares (later shown to be pregnant) taken earlier than one month after service have given uniformly negative results when tested. The lowest concentration that could be demonstrated by the test is 300 M. U., and there is some possibility that lesser amounts than this may have been present, but, as pointed out earlier, much more than this amount may readily be excreted during œstrus by a non-pregnant animal. From the fortieth day onwards until about the sixtieth day the amount present may not greatly exceed what is excreted by the non-pregnant mare, and a second test would be desirable to confirm a positive preliminary diagnosis. A negative diagnosis is, however, often as valuable as a positive one at this stage, since it may still be possible to secure a late service from the stallion. In the great majority of cases it would appear to be advisable to accept a negative diagnosis during this period as definite evidence that a mare under question was non-pregnant.

From the sixtieth day onwards there should normally be only a small percentage of mares which do not excrete a sufficiency of œstrus-inducing hormone to enable a positive diagnosis being accepted, and with such doubtful cases, a second sample, taken ten to fourteen days later, would yield definite information.

ACCURACY OF THE TEST

Although at the present stage a certain number of refinements of detailed technique would seem desirable, the accuracy obtained is sufficiently encouraging to justify the claim that the test can be utilized to enable the practitioner to make a diagnosis of pregnancy earlier than by clinical means.

A total of 390 samples have been examined at the date of writing. In three cases the biological diagnosis did not agree with the clinical evidence. Two of these were among the first few samples to be examined, and were not based upon a quantitative estimation of the hormone content, but solely upon the occurrence of cornification. The explanation of the other erroneous diagnosis seems doubtful. A positive diagnosis was given, but the mare did not prove to be pregnant. There was some suspicion that abortion took place while the mare was at grass during the summer, but the evidence was inconclusive. There is always a possibility that mares with cystic ovaries or those suffering from nymphomania might yield positive results though non-pregnant, and we have some evidence that this has actually happened. The presence of ovarian tumours capable of disturbing endocrine functioning might occasion error in the interpretation of the test, as might exhibition of an exceedingly intense œstrus at the time of taking the sample. Pseudo-pregnancy, exceedingly rarely recognized in the mare, though common in bitch and other smaller animals, might account for some cases erroneously diagnosed as pregnant. In the human Pregnancy Diagnosis Station, the test agreed with clinical findings in over 97 per cent.

of cases, and nowadays the scientific interest is concentrated upon those cases in which disagreement exists. This, undoubtedly, will be the case also if and when the routine pregnancy diagnosis is extended to the cases of domesticated animals.

Reviews

MIDWIFERY.—By Ten Teachers. Under the direction of C. Berkeley, M.A., M.D., M.C. (Cantab.), F.R.C.P. (Lond.), F.R.C.S. (Eng.), F.C.O.G. Fourth Edition. London: Edward Arnold and Co., 1931. Pp. xi plus 740. Illustrated. Price, 18s. net

THIS is the fourth edition of this book which is meant to be a guide to students appearing at examinations in Great Britain, but we are of the opinion that the editors would have done well to consider some of the problems that sweep into the daily ken of practitioners in distant lands, for by so doing they would touch a wider audience. Therefore, we would suggest that they include in the well-assured fifth edition a separate section dealing with tropical conditions, for scores of the students of to-day find their way to distant lands where conditions are new and literature scanty, with the result that it is but by bitter experience they make good, whereas their mistakes are a source of mirth and wonder to lesser qualified confrères. Take, for instance, osteomalacia, tropical anæmia of pregnancy, tetany, pregnancy dysentery, and a score of other problems connected with the fœtus and pelvis, which accumulated experience has crystallized into opinion of value.

It is idle to criticize the arrangement of a book, for every teacher approaches his subject from a different angle, but we would suggest a little more liberality in treatment throughout the volume, for it is a mistake to teach *Kismet* and finality when there are alternative treatments possible in order to obtain a living child, for instance, in the unrotating occipito-posterior all treatment may fail or if it does not fail it is almost certain that the fœtus will be born dead or injured, surely then it is wise to teach the benefits of the low Cæsarean section. But no mention of this operation is found in the index or text, which is indeed remarkable considering its great use in many cases or even all such cases where a live child and live mother is aimed at. Again there is no mention of Cæsarean for the large breech with extended legs, or prolapse of a pulsating cord, though it would be interesting to know how often the authors have delivered a live child using the catheter method.

To our mind the continued reference to the use of the de Ribes' bag is an anachronism, for outside the precincts of a hospital we have never known a general practitioner to possess one that was not faulty or a source of extreme danger to the mother.

Again, we think it is a pity that no praise is made of Hobbs' glycerine treatment in cases of puerperal sepsis. Verily a prophet hath no honour in his own land, for we saw this method in use and extolled all over the Continent and certainly our experience is in agreement.

These are but errors of omission that can be easily rectified if each editor will put himself in the position of a student or practitioner 'up against it' at examination or in practice.

This is a thoroughly practical book that will have a large sale, it is for this reason we seek to add to its greater use to students. The best chapter of all is that on disproportion.

We shall look forward confidently to the next edition with just that added *cachet* of a work not only of 'ten teachers' but of ten consultants on the staffs of great hospitals who deal with problems met not only in hospital but in practice, which must be taught to students, who on qualifying will be confronted with them and

consider themselves aggrieved if their teaching does not meet the situation.

V. B. G-A.

FEMALE SEX HORMONOLOGY.—By W. P. Graves, A.B., M.D., F.A.C.S. Philadelphia and London: W. B. Saunders Company, 1931. Pp. 131. Illustrated. Price, 17s. 6d. net

It is not many years since the medical world was intrigued by the work done and proofs shown regarding the omnipotence of the thyroid gland. It was called 'the sun round which the body rotated', 'the draught to the fire', 'the sparking plug of human metabolism', terms comprehensive and doubtless correct. Now in this small volume Professor Graves sets out to review and make clear the romance of the hypophysis, and there can be no question that he has achieved his object in a masterly and fascinating manner, indeed like some detective story the tale unrolls, and for myself I never put the volume down until I had finished it, so intriguing did I find it.

He begins by telling us of the speculations of Gustav Born who noted that the fully-developed corpus luteum reaches its peak in placental mammals just at the time when the embryo is attached to the uterus, and observed that the decidual changes in the uterus were not due to the ovum, but to some internal secretion from the corpus luteum which had been activated by the irritating effect of the embryo in the uterine cavity. Gustav Born in the midst of his experiments died, but his mantle fell on Fraenkel who proved he was correct, and later Leo Loeb confirmed Born's view that the corpus luteum secretes a hormone which prepares the endometrium for nidation of the egg.

Professor Graves then takes us through the uterine menstrual cycle beautifully illustrating it by photomicrographs of the proliferative stage and the secretory stage with its saw-toothed tufted glands. He shows that the ovary runs a double cycle, first that of the growing follicle up to the point of ovulation and secondly that of the corpus luteum which persists actively for about eight days if pregnancy is absent, or till the end of pregnancy.

Corner proved conclusively that there were two hormones in the ovary, the one of the follicle he called œstrin, a growth hormone having its specific influence during the proliferative stage of menstruation, the other of the corpus luteum he called progestin, having the specific function of sensitizing the uterine mucosa for nidation of the ovum. These two hormones are antagonistic, for during pregnancy and sometimes during lactation, ovulation does not occur, moreover it has long been known by veterinary surgeons that persistence of the corpora lutea in the cow causes non-ovulation and sterility. But though antagonistic, there can be no doubt that the products of these different cycles of the ovary are collaborative for without the hormone of the follicles, experiments prove that the uterus cannot arrive at that physiological state in which it responds to the hormone of the corpus luteum.

Having carried us with him so far, the author then leads us on to the experiments and clinical findings that focused the attention of the biochemists upon the hypophysis, and culminated in the classical work of Zondek and Aschheim, with the discovery of the luteinizing effect of the hormone prolán, that is the production of unruptured follicle with imprisoned ova. Continued animal experiments however soon demonstrated the fact that the hypophyseal hormone prolán had two constituents the one they called prolán A, because it caused ripening of the follicles, the other prolán B, because its effect was that of luteinization and resembled the secretion of the progestin hormone of the corpus luteum.

Wiesner working on different lines arrived at the same conclusion, the only difference being that of nomenclature, he naming the two hormones RHO 1 and RHO 2.

The end result of all this intricate work is that now we can state that the anterior lobe of the hypophysis

is the motor of the sexual function, and the hormones of the anterior lobe are the specific hormones of sex.

Professor Graves then takes us along the path of intuition and argument, and shows us the likelihood of two types of menstruation, the one that is preceded by ovulation and the one that is not; and then the explanation of dysfunctional bleeding is made clear by the presence of cystic ovaries and absence of the corpus luteum, a clinical condition every surgeon has noted.

Still more fascinating is that part of the book that deals with research on the onset of parturition, for that has been a fecund source of speculation during the last decade. Now however it has been shown that during pregnancy the quantity of follicular secretion (œstrin) gradually increases with the object of sensitizing the uterus to the contracting influence of the posterior pituitary hormone, oxytocin, but in that the hormone of the corpus luteum is synergistic to that of the follicle, the œstrin has no influence on the posterior pituitary until the corpus luteum disappears at the end of pregnancy.

The explanation therefore of post-maturity is that either the quantity of œstrin has not sufficiently sensitized the posterior pituitary, or that the corpus luteum hormone which normally holds œstrin in check is still being secreted in sufficient quantities owing to non-disintegration of the corpus luteum. We have said above that folliculin (that is œstrin) owes its origin, or sensitization, to the anterior pituitary hormone, prolán A, but there is no doubt whatever that folliculin is found in the placenta. Up till recently little reverence was paid to the placenta, but now biochemists have proved that it is a storehouse and provider of such substances as vitamins, insulin, thyroxin, folliculin, and anterior lobe hormone prolán, some authorities even going so far as to assert that prolán is produced by the hypophysis with the help of the placenta. This side of the problem is still under research, so it will be well to stress the views of Zondek:—'Without the anterior lobe and its hormone, no sexual activity, no ovulation, no sexual rhythm. Without the anterior hormone, atrophy of the sexual organs. Without the anterior lobe no conception. With disturbance of the anterior lobe death of the egg.'

The last chapter of the book deals with the futility of the craze for oral administration of such substances as ovarian and corpus luteum preparations in view of recent research. But doubtless the time is not far distant when prolán A and prolán B will be available along with the two hormones of the ovary for hypodermic or intravenous use, and then a scientific food of the gods will be possible for the amenorrhœic, the sterile, the obese, the habitually aborting woman.

The above sketch of the contents will I trust instil enthusiasm into all scientifically-minded gynaecologists. This is indeed a book to possess and conjure over, for it opens one's eyes to many problems of the clinic and operating theatre.

V. B. G-A.

CLINICAL EXAMINATION AND SURGICAL DIAGNOSIS.—By Felix Lejars. Translated from the French, by Helen C. Scott, M.R.C.S., L.R.C.P. London: Jonathan Cape, 1931. Pp. xi plus 872. Illustrated. Price, Rs. 37-8 net. Obtainable from Messrs. Butterworth and Co. (India), Ltd., Calcutta

PROFESSOR LEJARS is well known to English readers by the translation of his *Chirurgie d'Urgence*, which has long enjoyed a well-deserved popularity, so that a translation of another of his works needs no introduction. The present book, which now appears in English for the first time, has long been a classic in French. It deals with methods of examination which are clinical in the strict sense of the term, carried out with eye and hand, which must precede every other investigation. At the present time there is a growing tendency to allow the results of laboratory and x-ray examinations to replace, if not to supersede altogether, the traditional

methods of examination. It is essential that every practitioner should be competent to observe, palpate, percuss, manipulate and to draw conclusions from his results, which may afterwards be supplemented by other methods. There is no other book which gives such full and exact information on surgical case-taking from this point of view and for this reason it is very welcome in its English dress.

The subject-matter is arranged by regions of the body, starting from the scalp and finishing at the toes. Everything of surgical interest which can be ascertained by inspection, palpation or percussion is set out with a wealth of detail, the product of vast clinical experience. The only criticism one can make is that the amount of detail is often so great as to obscure the more important points, so that the book is unsuitable for the use of students. There is really nothing left out, though the references to tropical conditions are brief, as is to be expected. As in all continental textbooks gynaecology is treated as a part of general surgery and in the same detail, but the other special departments are omitted. The illustrations are profuse and well selected, and add greatly to the value of the book, but their quality is poor, perhaps on account of the long use of the blocks in the original French editions. The translator is to be congratulated on the extent to which the lively style of the original has been retained, so that it remains an essentially French book.

For teachers who have to give courses of demonstrations on clinical methods the book should be of great value, though it is rather too detailed in its treatment of the subject for the use of students. Still it is a notable addition to English surgical literature and we wish it the success it deserves.

W. L. H.

BRAIN AND SPINAL CORD (EMIL BILLIGER).—

Edited by William H. F. Addison, B.A., M.D. Fourth Revised American Edition. Philadelphia and London: J. B. Lippincott Company, 1931. Pp. x plus 337. Illustrated with 262 figures, many in colour. Price, 25s. net. Obtainable from Messrs. Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 18-12

PART I deals with the gross morphology of the brain and spinal cord, beginning with the development of the parts in a general way. The subdivisions of the brain have been dealt with one after another.

In part II the fibre tracts have been depicted and described. This chapter embodies the most up-to-date information regarding the courses and connections of the fibre tracts and the connections of the rhinencephalon have been very carefully traced.

Part III presents a set of beautiful serial cross sections of the brain-stem, from one end to the other, the study of which is very instructive and gives a clear conception of the fibre tracts and nuclei.

The book is profusely illustrated and many of the illustrations are in colour. This revised edition will be extremely useful not only to students of anatomy but also to senior students of medicine in their neurological work.

N. P.

THE ACUTE ABDOMEN.—By C. H. Fagge, M.S. (Lond.), F.R.C.S. (Eng.). (Pocket Monographs on Practical Medicine.) London: John Bale, Sons and Danielsson, Ltd., 1932. Pp. viii plus 92. Price, 2s. 6d. net

This small volume of less than one hundred pages is one of the 'Pocket Monographs on Practical Medicine' series. It is the best value for half a crown that the reviewer has ever read and will repay the surgeon and general practitioner alike many times over for this outlay. It can be read and re-read with pleasure and profit.

It is in three parts, an introduction of 7 pages dealing briefly with symptoms and signs, 51 pages of differential diagnosis, and 33 pages dealing with treatment. Compressed into this small compass, the practical

experience of the author is given, rejecting everything which he has been unable to confirm. The practical surgeon will observe with gratification that he attaches no importance to the alleged absence of liver dulness in perforation; this is a sign which is given a place of conventional prominence in textbooks and is apt to mislead house surgeons and students. Those who have had practical experience of blood transfusion will heartily agree that the citrate method is the only one that can be relied upon and that all the ingenious instruments for any other method merely end in disappointment or worse.

It is a pity that strangulated hernia has been omitted as this is the commonest acute abdomen in Indians—at any rate in Calcutta. Acute appendicitis being the commonest in England is given pride of place. The author's practice is to operate during the first three days of the attack; after that he waits unless a rising pulse or temperature, increasing swelling, vomiting or other signs of abscess appear. He considers any treatment for general peritonitis almost futile but that the best results are obtained from non-operative treatment with the Fowler position, continuous saline *per rectum* and morphia. Oschner's name is not mentioned. The right paramedian incision is his incision of choice, unless there is an abscess or there is no room for doubt about the diagnosis; in these cases, he prefers the muscle-splitting incision. For ileus after any operation, if pituitrin and eserine fail, he recommends morphia (which is unusual), bile enemata, radiant heat and lastly spinal anaesthesia. The antitoxin of *B. welchii* is spoken well of in peritonitis.

For renal colic atropine 1/100th grain is recommended instead of morphia. In acute cholecystitis rotation of the liver is said to be more easily obtained by traction on the gall bladder. This is a procedure with which many will not agree owing to the friable state of the gall bladder.

Hæmorrhage from the stomach in cirrhosis of the liver is not mentioned.

These few points which we consider open to criticism only serve to emphasize the general soundness of the monograph. No doctor should omit to read it.

S. McS.

DISEASES OF THE THYROID GLAND.—By C. A. Joll, F.R.C.S. London: William Heinemann (Medical Books), Ltd., 1932. Pp. xviii plus 682, with 283 figures in the text and 24 plates. Price, £3 3s. net

MR. C. A. JOLL must be congratulated as the author of this extremely valuable book on diseases of the thyroid gland. The manual is intended for the senior student and practitioner, and deals very comprehensively with the anatomy, histology, physiology and pathology of the gland; it is very clearly written and beautifully illustrated. One rarely has the pleasure of reviewing such a work. The author is obviously an expert in his subject, and is able to express his knowledge on paper. The treatment of the different diseases that affect this gland is dealt with in great detail and every step of the surgical technique is given. The chapters on thyrotoxicoses are particularly good; the author divides them into two distinct classes, primary and secondary. The causes of the primary thyrotoxicoses are subdivided into two groups; heredity and the influence of the nervous system are considered to be the two main predisposing factors, whilst the exciting causes are stated to be infectious diseases, anxiety, worry, and shock. There is little doubt that the excessive function of this gland is due primarily to some toxic action, the effects of which are likely to be more powerful on the gland of a person who already inherits a high degree of activity. An attempt is made to separate the secondary thyrotoxicoses; this appears to be rather an artificial distinction because probably all the cases are really secondary from some internal cause. The book can be strongly recommended to those physicians and surgeons

who are interested in the treatment of the diseases of this gland.

H. W. A.

BACKACHE.—By L. F. Barker, M.D., LL.D., and J. H. Trescher, M.D. London: J. B. Lippincott Company, 1931. Pp. xiii plus 235, with 55 illustrations. Price, 21s. net. Obtainable from Messrs. Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 15-12

THE *Everyday Practice Series* is a comparatively new series of monographs which will be appreciated by those practitioners who require short and concise accounts of various ailments of common occurrence. The present volume, *Backache*, by Dr. Barker and Dr. Trescher of the Johns Hopkins University is a valuable addition to the series.

Perhaps no other symptom is so common or so distressing as pain in the back, and in many cases the cause of the pain is so obscure that only empirical treatment can be carried out.

The authors have attempted to remove some of the difficulties that surround this subject and it may be stated at once that, to a great extent, they have succeeded.

Following a short introduction, the practical anatomy and physiology of the back as a supporting column and a mechanical entity are described. The important points in the clinical history and the methods of carrying out a thorough physical examination are then discussed and this section includes the roentgenographic examination. The section concludes with 'Comments upon interpretation of data accumulated'.

The various diseases of the spine and back are then described in a systematic manner, and the diagnosis and methods of treatment are fully discussed.

Many backaches are dependent upon conditions other than disorders of the muscles, bones and joints of the back, and these find their place in this book.

The authors are of opinion that gynaecological conditions, although frequently blamed, are in reality a quite uncommon cause of backache, and that the popular and dramatic advertisements which implicate the kidney and uric acid are the result of imagination rather than of practical experience.

The book concludes with a chapter on apparatus designed to immobilize the spine, massage and exercises. The volume is well produced, well illustrated, and contains a bibliography and complete index.

There is no doubt that every medical practitioner will find much in this monograph which will help him in elucidating and treating the frequent and distressing symptom of backache.

H. H.

NUTRITION AND PHYSICAL FITNESS.—By L. J. Bogert, Ph.D. Philadelphia and London: W. B. Saunders Company, 1931. Pp. 554. Illustrated. Price, 14s. net

THE subject of nutrition and its relationship to physical fitness is one that should interest all educated people. Indeed, so important is it that it might well form part of the curriculum in schools and colleges, taking a place amongst the basal subjects taught therein. For a knowledge of how to attain to optimum health, and of how to remain in that desirable state, is surely a necessary part of a sound education. It is well, therefore, that textbooks dealing with this subject should be available for the instruction both of the young and of older people. The book before us—*Nutrition and Physical Fitness*—is one of the best of its kind, and though intended primarily for the American people its utility is not limited to them. It gives a comprehensive and up-to-date account of the whole subject; the physiological conception of nutrition being emphasized throughout its pages. The reader is told all that is needful in regard to the essential components of a properly constituted diet and how these should be combined with one another for the maintenance of nutritional harmony. He learns what the body does with

food and what faulty food does to the body: how bodily functions—digestive, respiratory, endocrine, excretory and others—are dependent on the use from infancy to old age of a diet suitably constituted for each period of life; and how bodily states—physical defects, posture, over-fatigue, mental strain, etc.—may interfere with the attainment to optimum nutrition, an aspect of the matter that is sometimes neglected. But in dealing with physical defects the authoress does not make it sufficiently clear that some of these defects may themselves be the result of faulty nutrition at an earlier period of life; their presence establishing a vicious circle. Some sixty pages, comprising part IV of the book, are devoted to the planning of meals, to food economics and influences of cooking, to food fads and fancies, and to 'recent trends in American dietary habits'. The last hundred pages (part V) contain much useful information in regard to diet for children, for pregnant and nursing mothers, for people over forty, for the convalescent, for the constipated, for the obese and for malnourished subjects. There is an appendix in which tables are given of '100-calorie portions of common foods' and of average heights and weights in men and women, boys and girls: all useful for an American public, but of limited interest to an Indian one.

This book is written in simple but somewhat prolix language; it tends to be overloaded with details which those who have no knowledge of chemistry or physiology may find it difficult to assimilate. But educated people, who are ardent enough to study it, will find it replete with sound teaching.

HYDROTHERAPY AND PHYSIOTHERAPY.—By Lionel C. E. Galthrop, M.B. (Durh.), M.R.C.S. (Eng.), L.R.C.P. (Lond.). London: William Heinemann (Medical Books), Ltd., 1931. Pp. xi plus 172. Illustrated. Price, 5s. net

THIS small volume which contains a great deal of information has been written for the use of nurses and bath attendants.

The contents are based upon the lectures that the author has given at the school of instruction for bath attendants at Harrogate.

The general principles of hydrology, the various methods of treatment and the technique involved are fully explained. There are chapters on radiant heat and light with a brief description of the simpler forms of electrical treatment. This book should prove as necessary and as useful to the bath attendant as the nursing textbook is to the nurse.

H. H.

LEGAL MEDICINE AND TOXICOLOGY.—By R. W. Webster, M.D., Ph.D. Philadelphia and London: W. B. Saunders Company, 1930. Pp. 862. Illustrated. Price, 37s. 6d. net

DR. WEBSTER is part author and one of the editors of the well-known two-volume work on legal medicine and toxicology of Peterson, Haines and Webster, the second edition of which appeared in 1923. This is a valuable standard work of reference and includes articles by no less than 42 specialists.

One's first thought in examining Dr. Webster's new single-volume work was to see what relation it bore to the earlier, larger work. Of this his own preface gives some indication. The purpose of the new work is stated to be to form a fairly concise guide for practitioners to the problems of legal medicine and to serve as a textbook for students. While the book is ably written we do not think the author has been quite successful in this. What the practitioner and student require is concise information on those problems of legal medicine which affect the daily work of the medical man, as distinct from details of chemical analysis which are the domain of the toxicological expert. While the author has followed the example of several others, we consider it no longer desirable to present these subjects in one volume. A student's textbook on forensic medicine, while it must contain an adequate

account of the medical side of toxicology, *e.g.*, symptoms and signs of poisoning, treatment, antidotes, fatal doses, and mode of performance of post-mortem examination in poisoning cases, it should not be burdened with details of toxicological analysis which should form the subject of separate laboratory manuals. Had the author proceeded on this plan the sections on toxicology could have been considerably curtailed. If a compromise is desired details of analysis can be relegated to brief appendices as has been done in some recent works on forensic medicine.

The sections on medical jurisprudence are also capable of some condensation. This would leave room for more adequate treatment of new branches of the subject, *e.g.*, the application of blood grouping tests to paternity which is dismissed in one page. While we think, as stated, that toxicological analysis on account of the size and complexity of the subject should be omitted, it is justifiable to include at any rate for the present a description of other forms of analysis which, either on account of their not being large enough subjects for separate treatment or by reasons of their novelty, do not find their way into laboratory manuals. For example, we see no reference to the use of the spectrograph, and the method of examination of projectiles by modern instruments is not discussed, though two figures taken from Sydney Smith's *Forensic Medicine* are given. The chapter on blood-stains is good though no mention is made of Takayama's important crystal test for blood. Figure 22, which is figure 85 of the larger work, showing the result of precipitin tests, is very unsatisfactory, the faint cloud shown being nothing like the actual result. In view of the difficulty of photographic reproduction a much stronger precipitation should have been chosen for the illustration in order that the inexperienced may realize that these precipitates are very definite things indeed.

Many of the chapters are very good, for example that on insanity and criminal responsibility, and we are glad to see numerous references to English legal practice in the matter. The section on gaseous poisons is interesting. The illustrations are mostly taken from the larger work above referred to.

R. B. L.

ANNALS OF THE PICKETT-THOMSON RESEARCH LABORATORY.—Volume I (in two parts), and Volume II. Part I. London: Baillière, Tindall and Cox. Pp. 296, with 50 plates and 7 figures in both parts of Volume I. Pp. 28, with 10 plates in part I of Volume II. Price, 42s. net per complete volume

FROM time to time the *Annals of the Pickett-Thomson Research Laboratory* have been reviewed in this *Gazette*. Recently, at our request, the publishers of these *Annals* sent us the first three numbers which had not previously been reviewed by us.

We are a little disappointed that the first volume does not tell us more about the genesis of the laboratory which, year after year, has given us these invaluable *Annals*. We must admit that except for the excellent work which they produce we know nothing about this laboratory; but industrious modesty is certainly a more satisfactory way of achieving lasting fame than using one's energies in the holding of public meetings and organising press campaigns to draw attention to oneself. The editor evidently decided to 'cut the cackle and got to the 'osses', as between the cover and the first article we are only given a contents list and some photographs.

The volume contains a number of papers on diverse subjects and suggests a wider distribution of the energies of the workers in this laboratory than was actually adopted in subsequent practice. The later tendency has been to concentrate more and more on a limited group of organisms; recent volumes have been devoted entirely to the streptococci.

The first paper is by David Thomson on the virus of smallpox and vaccinia. Though the weight of opinion is in favour of the inclusion bodies which he describes

and depicts—in the usual excellent coloured plates and photographs to which we are always treated in these *Annals*—being the causative organism, he rightly says that until they can be isolated and grown, no amount of circumstantial evidence will prove that they are the micro-organisms at all and, further, that until these cultivated organisms can be made to produce smallpox or smallpox-like lesions in animals or man they cannot be accepted as the specific cause of the disease.

Two other important contributions to this volume are on the aetiology of measles and scarlet fever, respectively, both by David Thomson. These subjects have been expanded considerably in the later *Annals*. There then follow some half dozen articles on various subjects, concluding with a report by the medical staff of F. N. Pickett et Fils on the treatment in cases of gas poisoning resulting from the demolition of gas shells.

In the second part of volume I, the editor has rectified an omission which was evidently noted by others besides ourselves; he now gives us a short preface in which he sets out the aims of the *Annals*. In the past, he says, there has not been sufficient photographic record of different species of micro-organisms; he proposes to issue from time to time fully-illustrated papers each containing from 300 to 400 photomicrographs (sometimes referred to by the editor as 'microphotographs'). Eventually, it is hoped, the accumulated volumes of these *Annals* will form an atlas of bacteria and other micro-organisms. At the same time he hopes to give an epitome of the literature and, as complete a list of references as is possible, on each of the various pathogenic bacteria which come within the scope of the laboratory.

The second part contains papers on the preparation of media for germs which are difficult to grow, on *Bacterium pneumosintes*, on the bacteriology of the respiratory tract, and on the classification and identification of germs by microphotography (*etc.*).

Part I of volume II is very small and contains only four short articles, including one on a new bacillus recovered from the throat, conjunctiva and skin rash in a case of measles.

Each part contains numerous excellently-reproduced photographs.

As we have repeatedly said, these *Annals* form an extremely important contribution to the world's literature on bacteriology; seven volumes have now been issued. In these difficult times it will be a strain on the finances of most libraries to purchase back numbers but to those who cannot afford to do this, we strongly recommend that they should start subscribing to these *Annals* immediately, in the hope that when better times come along they will be able to complete their sets by purchasing the back numbers.

L. E. N.

THE ANOPHELINE LARVÆ OF THE COUNTRIES FROM INDIA AND THE ORIENT TO THE ANTIPODES.—By C. Strickland, M.A., M.D., B.Chir., and K. L. Chowdhury, M.B. Calcutta and Simla: Thacker, Spink and Co., Ltd., 1931. Pp. 36. Illustrated. Price, Re. 1-12

THIS is the only attempt to produce a key to the Anopheline larvæ, not of 'India, Burma and Ceylon', or of restricted areas further east, but to the entire segment of the globe, embracing two whole faunal regions, including western intruders from a third. As such it stands unique.

The booklet under review cannot be used without the original volume by the same authors, to which it is a supplement; it follows the same plan, which runs contrary to both of the generally accepted forms of 'key' compilation, but which has doubtless been found by the authors more useful than either for the type of students the senior author has to train, and as such must be accepted without further criticisms, though we find it more difficult and time-consuming to use ourselves than the form in general use.

One could wish that the illustrations were less amateurish, more symmetrical, and better finished off.

We note that the authors retain the name *funestus* for the group comprising in the Orient the species (or subspecies) *listoni*, *minimus*, *varuna* and *aconitus*. As Christophers has shown that *funestus* (*sensu stricto*) is purely African, and by its egg structure an entirely separate species, this attitude needs at least modification. With the attitude itself we feel great sympathy, for long since we prepared, from the small Ceylon fauna only, a series of specimens completely annectant right through the four names. But *funestus* as the group name cannot any longer stand. The priority of *listoni* and *minimus* appears still unsettled, and Edwards has resurrected the old *fluvialis*. Even this in a name-grouping would not settle the question without further priority researches, as *aconitus* is also 1902. The question is a very thorny one on which, in spite of the strictures of Swellengrebel on the senior author of the work under review, the last word has been far from said. Critical enumerative studies, with calculation of the co-efficient of variation for the specific markings in each form, are still required, and perhaps Drs. Strickland and Chowdhury will defend their attitude (with which the reviewer has every sympathy) by undertaking them.

R. S. W.

ELEMENTARY HISTOLOGICAL TECHNIQUE FOR ANIMAL AND PLANT TISSUES.—By J. T. Holder, F.R.M.S. London: J. & A. Churchill, 1931. Pp. vii plus 104, with 23 illustrations. Price, 7s. 6d. net

In this book some of the recognized methods for examining animal and plant tissues are described in a simple and lucid manner. Its aim appears to be not to supply the needs of the specialist or the skilled technician, but rather to assist and guide the beginner who is desirous of doing histological work by himself. For this purpose, it is undoubtedly a very useful book. The get-up is good, the size of the book is small and handy, and there are also a few illustrations. Although there is nothing of outstanding interest in the book, it is concise and clear, and will serve its purpose well.

K. V. K.

Annual Reports

THE ROCKEFELLER FOUNDATION. ANNUAL REPORT FOR 1930

LAVISHLY illustrated, and well written, the annual reports of the Rockefeller Foundation are always of absorbing interest. Yet the reports themselves are so much of the nature of reviews that they are difficult to review or to abstract from; there is hardly a country in the world where the splendid activities of the Foundation are not in evidence. In the main, the Foundation's medical work follows two lines—medical research, and aid to public health organisations.

The first section of the 1930 report deals with the field research work of the International Health Division, and here the history of the recent work on yellow fever in West Africa is summed up in most interesting fashion. Two main discoveries stand out in the history of research work on yellow fever; the first the discovery by the Yellow Fever Commission in 1900 of the rôle of the *Stegomyia* mosquito in transmitting the disease; the second the discovery by Stokes, Bauer and Hudson in 1928 that certain species of monkey, especially *Macacus rhesus*, are susceptible to infection. The serum of a person who has had yellow fever, even years previously, will protect *Macacus rhesus* from experimental infection, and this immediately provides a laboratory method of ascertaining whether a given person has or has not at any time had yellow fever.

Sir Rupert Boyce in 1911 on theoretical grounds expressed the opinion that the West African Negro is as saturated with yellow fever as he is with malaria, and the Rockefeller Commission decided to investigate

this point first of all. They selected the city of Ibadan in Nigeria, with a population of 250,000 inhabitants, where epidemic yellow fever was known to have occurred. By the serum-monkey test outlined above, they found that 32 per cent. of the inhabitants had had yellow fever at some time or other. At Ilorin, from which yellow fever had never been reported, 6 out of 25 samples of serum gave positive results; in Ife, a town of 30,000 inhabitants, 68 per cent. of the population were found to have had yellow fever. These results confirmed what had been suspected but never proved; that some of the large cities of West Africa constitute endemic reservoirs of yellow fever, with occasional epidemics in the native population, whereas the isolated villages and small inland towns were found not to be infected. The disease is usually mild, it chiefly affects the child population, in brief it rather takes the place that measles occupies in the white races in Europe. This situation was not dangerous as long as travel facilities were limited; but with the advent of the railway, the motor car, and the aeroplane, it becomes a menace to those parts of the tropics which are not yet infected; it has been shown experimentally that *Aedes aegypti* of both India and the Federated Malay States is capable of yellow fever transmission.

In 1930 overt yellow fever was but little in evidence in West Africa; there were only a few diagnosed cases in Brazil, where the utmost possible anti-mosquito measures are in force. Freetown, once the 'white man's grave', is now fully protected, and has had no epidemic since 1910.

Recent studies have shown that *Macacus rhesus* is not the only species of monkey susceptible; to some extent the woolly, spider and squirrel monkeys of Brazil react; the marmoset is susceptible, also some of the West African species of monkey. Inoculation of the rabbit and guinea-pig is not followed by infection, but antibodies are produced. White mice are susceptible if inoculated intracerebrally, and an encephalitis results; on inoculation of brain tissue from these animals into monkeys yellow fever results. The experimental work on mice by Dr. Theiler may provide a smaller and less expensive animal than monkeys, with the aid of which the large areas in Africa where the disease occurs in mild, endemic form may be mapped out.

Work during the year in West Africa and Brazil has resulted in ten other species of mosquito, in addition to *Aedes aegypti*, being incriminated as possible or probable vectors of the disease. Patients and monkeys may prove infective to mosquitoes at least one day before the appearance of clinical symptoms. The virus cannot be transmitted direct from mosquito to mosquito, and it would appear that any immune bodies ingested from the vertebrate host by the mosquito are destroyed in its gut by digestion. Attempts to transmit directly by mechanical transference on the proboscis of the mosquito had negative results. A compilation was made during the year of the recognised vectors, geographically arranged, and embodying both published and unpublished material. An important development of the year was the invention of an instrument known as the 'viscerotome'; with this a medical man in an isolated station, or even a layman, can obtain liver sections at a post-mortem which is hardly more than a simple puncture, whilst the operator need not touch anything except the instrument and all possibility of accidental infection is eliminated.

It is sad to record still another death from accidental laboratory infection during 1930; Dr. Theodore B. Hayne, aged 31, one of the younger workers on the Commission, died of accidentally-acquired yellow fever at Lagos on July 11th, 1930, after four days' illness. No less than five members of the Rockefeller Commission have died from accidental laboratory infection; Howard B. Cross (1921), Adrian Stokes (1927), Hideyo Noguchi (1928), Paul A. Lewis (1929), and Theodore B. Hayne (1930). Amounts as small as one billionth of a cubic centimetre of infected blood have been found to be experimentally infective.

The next section of the report deals with the Foundation's activities in connection with malaria, and here the work is too enormous to be summarised. During the year the mosquitoes of Porto Rico and of the Philippine Islands were studied and systematic classifications made. Improvements in technique include the use of dental instruments for dissection and a rapid method of staining. The control in Italy under Dr. L. W. Hackett is one of the outstanding successes in the whole history of malariology. India owes to the Rockefeller Foundation the present investigation and control in Mysore State.

The anti-hookworm activities of the Foundation are worldwide. During the year, Professor Lamson of Vanderbilt University discovered that hexylresorcinol, a white, waxy, crystalline substance, will remove 90 per cent. of the hookworms harboured by an individual, whilst it also has great value as an ascaricide; the drug has local irritant properties but no toxic effects. Necator infections are ordinarily slowly acquired and slowly lost, and in the absence of reinfection the life span of hookworms in the human intestine may extend to four years or longer. In the South Seas, Rennell Island, an isolated islet with a population of some 1,500, showed a hookworm rate of 56 per cent. The anaemia of ancylostomiasis is being studied; it is certainly not due to ingestion of blood by the worm; it has a tendency to appear rather suddenly when the infestation reaches a certain degree of intensity, and it is probably of secondary or toxic origin. In 1930 the Foundation contributed funds and workers towards anti-hookworm campaigns in eighteen countries.

Field research work has been commenced on respiratory diseases; epidemiological surveys have already been carried out in Alabama, Labrador, and the Virgin Islands, and a new survey was commenced at Spitsbergen. The common cold is due to some specific agent with which we are not yet familiar; it is infectious in nature and spreads by direct contact. Environmental factors, and especially a drop in the atmospheric temperature, may increase the incidence. Colds are less common and less severe in the tropics than in the temperate zones.

Other investigations carried out during the year included a survey of the prevalence of syphilis in Negroes in Mississippi; 20 per cent. of apparently healthy persons were found infected. Brewer's yeast, a dose of one ounce daily, was administered to a group of 176 pellagra patients; results were excellent.

The second section of the report by the International Health Division deals with aid to State and Local Health Administrations. Here it is impossible to review the immensity of the work undertaken by the Foundation; aid is given for fellowships, for the work of local health departments, statistical bureaux and bureaux of epidemiology; for public health, nursing, sanitary engineering, district health work, and general health surveys; to institutes and schools of hygiene; and towards the health work of the League of Nations. A map of Europe shows by way of example the very varied and widespread work of the Foundation; in Central Europe and the Balkans the rise of public health work during the decade since the war has been spectacular. In the United States the year saw 534 full-time county health organisations in operation, whilst the Rockefeller Foundation assisted 24 states in the United States and the governments of 17 foreign countries to develop modern local health organisations. The First Midwifery School at Peiping (Peking) received aid, and a large building was taken over and remodelled to hold 100 beds. A medical school at Fiji was among the many which received help. Fellowships granted numbered 173, including 8 to India. During the year the Foundation's expenditure on public health work totalled \$2,233,311; during the inclusive period 1913-1930 the total expenditure under this head has been \$42,435,856.

The third section of the report deals with the medical sciences, and largely with medical education. The death of Dr. Richard M. Pearce, for ten years the

brilliant Director of this division, was an irreparable loss to the Foundation. Under this section, the international exchanges and visits of teachers and administrators was continued, and a survey made of medical education in Greece. One hundred and two fellowships were granted, and included candidates from almost every country in the world. Aid for medical research work was given to the Institute of Experimental Biology, Copenhagen; the Institute of Cell Physiology, Berlin-Buch; Cornell University; Harvard University; Columbia University; and many other institutions. India owes the new All-India School of Hygiene and Public Health to the Foundation. Many universities received grants for research work and for medical education.

The last three sections of the report deal with the work done and aid afforded in connection with the natural sciences, the social sciences, and the humanities. Here again there is an immense amount of beneficial work and aid given recorded. Two of the most interesting grants were one to the Bodleian Library at Oxford, in connection with which a commission from Oxford visited forty libraries in Canada and the United States to study library methods and devise the best methods for the extension of the Bodleian; and a grant in 1928 of £700,000 to the University of Cambridge towards the construction and endowment of a university library, in which connection in 1930 a similar commission from Cambridge visited university libraries in Europe and America.

ANNUAL REPORT ON THE HEALTH DEPARTMENT OF THE MUNICIPALITY OF SINGAPORE FOR THE YEAR 1930. PRINTED BY C. A. RIBEIRO & CO., LTD., SINGAPORE, 1931

DR. HUNTER is an experienced and able health officer whose work on the prevention of malaria is very well known. His annual reports are also suggestive and full of interest and the present one is no exception.

The outstanding feature in the health of Singapore for 1930 was the complete absence of cholera, plague, and smallpox during the year. This is surely a record in any eastern town, especially a seaport town. 158 cases of typhoid were notified and 102 deaths registered. The notified cases therefore represent a small proportion only of the actual number of cases which Dr. Hunter estimates at 500. With a good water supply and milk supply, of which 95 per cent. is tinned, he is somewhat at a loss to find the cause for so many cases. Surely however the fact that a large proportion of the town is still provided with service latrines and privies is a likely cause. Flies are not common, however, and the 'filthy fingers' of hawkers are likely sources of infection. Dr. Hunter does not like hawkers and they are being gradually driven off the streets and are taking to licensed shops, a move in the right direction.

1,662 deaths are reported from tuberculosis, the disease is notifiable but only 961 cases were reported, and there must be many thousands of cases at any one date in Singapore.

63 deaths from diphtheria were reported. An interesting examination of throat swabs of children under 10 years whose bodies were unclaimed was made, and in 4 per cent. the diphtheria bacillus was recovered; this supports Dr. Hunter's opinion that diphtheria is much commoner than it is supposed to be. The population of Singapore is roughly 500,000, of whom 75 per cent. are Chinese, 4.5 per cent. Malays, 4.1 per cent. Indians, and 0.48 per cent. Europeans.

The birth rate was 35.7 per 1,000, the death rate 27.73, the infantile mortality rate 197.2 per 1,000 births. Compared with 1929, there were by estimation 753 more deaths in 1930. Half of these were accounted for by an increased infantile mortality rate. Of the other diseases causing increased mortality Dr. Hunter puts malaria first. In Singapore the drier the year, the more malaria. The death rate from this disease is enhanced by many cases coming from the surrounding country.

The lower standard of living all round occasioned by the slump in rubber and in trade generally practically accounted for the increased mortality. The total amount spent on anti-mosquito work was \$144,000. *A. ludlowi* is still a serious problem and the chief new anti-malarial work in the year was the construction of tidal gates on the Whampoe River. The salinity of the water has been reduced to 2.2 per cent. and a reduction of *A. ludlowi* breeding has been noted. The results are encouraging. *A. ludlowi* at present in Singapore does not seem to be highly infective; during the year of 3,361 dissections, 14 showed oöcysts, none showing salivary gland infection. The time of year is not stated.

Some interesting figures are given of the maternity and child welfare work. In 1915 training and registration of midwives was made compulsory. The maternal mortality in 1910-19 was 10.63 per 1,000 births; in 1930 it was 4.35, a very notable result.

The most significant fact is the reduction in puerperal sepsis.

Some interesting observations on the incidence of tuberculosis in pigs are given. There was evidence of tuberculosis in 356 pigs and 243 oxen. The cases in pigs are mostly of the avian type. In the water supply some difficulty is experienced with iron. In the rapid filters, too high dosage of alum results in the generation of CO₂ in the filter bed, with resolution of the deposited iron. The dosage of alum was reduced and a small quantity of lime in solution added after filtration. Some interesting work on 'bio-flocculation' of sewage by activated sledge is recorded.

The low rat flea index is suggested to be due to ants which seize and carry away thousands of flea larvæ.

ANNUAL REPORT OF THE DIRECTOR OF PUBLIC HEALTH OF UNITED PROVINCES OF AGRA AND OUDH FOR 1930. THE SUPER-INTENDENT, GOVERNMENT PRESS, UNITED PROVINCES. PRICE, RS. 6-8

THE Public Health Department of the United Provinces has a very good organisation, both for its central, district, and special branches; and at least in the past has perhaps had more funds at its disposal than some of the other provinces in India; a fact of which it has not been slow to take advantage.

The report is now compiled in a more interesting and systematic form and does not follow the cut and dried lines previously laid down by the Government of India. The population of the United Provinces in 1931 was 48,423,264, an increase of about 7 per cent. over that of 1921. The population estimated by natural increase was 900,000 too much, due to the fact that emigration is considerably greater than immigration in the United Provinces, and also that the recorded births and deaths are probably inaccurate to a considerable percentage, especially on the birth side. The Director intends to give birth and death rates on estimated populations in the future, by adding to the difference between births and deaths a number for emigration and immigration based on the actuals of the previous years. The birth rate, death rate and infantile mortality for the year were 34.97, 25.49 and 170.8 respectively.

Of the causes of death, 'fevers' accounted for 20.77 per 1,000, cholera 1.35, respiratory diseases 0.77, dysentery and diarrhoea 0.36, smallpox and plague 0.24 each per 1,000.

Cholera is said to be due mainly to imported cases from other areas. Powers to stop travellers coming from infected provinces are in the opinion of the Director necessary. The usual precautions and preventive measures are taken.

Perhaps the most interesting part of the report is the special sections dealing with the Magh Kumbh Mela at Allahabad. Most sanitarians will already have read the special report on the sanitary arrangements made at the Kumbh Mela, but how many who have heard of the Kumbh Mela know that 'Kumbh' was the vessel which contained the *amrit* or nectar which the gods

sought, and which was produced by the churning of the ocean of milk; or that the 12-yearly intervals of the the mela represent the 12 days during which the gods and demons fought for the *amrit* contained in the Kumbh; or that the mela occurs when the planet Jupiter is in the constellation of the Bull and the sun and moon in Capricorn. The description of the mythology and the significance of the mela is very interesting and as the writer says the enormous conclave of people shows what a hold the elements of religion still exert on humanity.

The various activities of the Department of Public Health are well described and not at too great a length to be boring; the publicity department in particular seems a very live one, and a great deal is being done in the villages where ideas and practice of cleanliness and sanitary tidiness are so essential, and so difficult to get. We have seen some of the health films prepared by the department and can testify to their suitability and excellent production.

Malaria is a very special problem in the United Provinces and the summary of the work done by the malaria branch shows the varied aspects of the problem and how much careful investigation and instruction is being done. Irrigation seems to have increased the malaria very definitely in Hardoi and Lucknow districts. The possibility of starting cinchona cultivation in the United Provinces has been explored and experimental cultivation at higher elevations is to be continued. A very interesting and well-written report; Colonel Dunn and his department are to be congratulated on the work done and on its presentation.

ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF ASSAM FOR THE YEAR 1930. BY LIEUTENANT-COLONEL T. D. MURISON, D.P.H., I.M.S., DIRECTOR OF PUBLIC HEALTH, ASSAM. SHILLONG: PRINTED BY THE ASSAM GOVERNMENT PRESS, 1931. PRICE, RS. 2-12

Administration.—Assam like other provinces has financial difficulties and the finger of retrenchment has been laid on the public health department in common with others. The post of public health engineer has been abolished, a measure presumably taken after serious deliberation, but regrettable in a province where cholera and malaria are endemic, where improvement of water supplies is of first importance. The amalgamation of the Public Health and Medical Departments was considered but wisely rejected. Lieutenant-Colonel Murison mentions the difficulties of public health control and action in rural districts where the civil surgeons are ex-officio the sanitary officers. Arduous duties at headquarters preclude any real activity in prevention on their part, and Colonel Murison states that little progress can be looked for until district health officers are appointed, and a rural health staff instituted in every police administrative area.

Kala-azar.—One naturally turns to the sections on this disease and much of interest is noted. The Kala-azar Commission ceased to function as sufficient material was not available. A chart is given of the mortality from kala-azar and the number of cases treated since 1920. There has been a steady drop since 1925 when 6,365 deaths were reported to 1930 when 953 deaths were registered. The excellent system of survey and treatment organised and carried out by the public health department has probably played a great part in this reduction of mortality and has hastened the natural decline of the epidemic. The number of cases in 1925 was 60,940, in 1930 16,430. Mass treatment with urea-stibamine (Brahmachari) was carried out.

Malaria.—The decline in kala-azar has redirected attention again to the real and permanent disabling disease in Assam, viz, malaria. It is difficult to gauge the actual mortality due to malaria as there is no separate heading for it under 'fevers', but an increase of deaths in Nowgong, Sibsagar, and Lakhimpur is ascribed to malaria.

The Assam Medical Research Society has been resuscitated by the efforts of Lieutenant-Colonel J. Morison, I.M.S., a special research worker has been engaged, and malaria will receive first attention. The excellent work carried out under Dr. Ramsay, Director of the Ross Institute, Assam Branch, is now well known and co-operation between the Governmental agencies and these two new organisations ought to result in a real advance during the next few years. These activities will be watched by scientific and public health workers with great interest.

The Public Health Department has carried out anti-malarial operations in Haflong, Lumding, Pasighat, Kohima, and Kachugaon.

Cholera.—6,332 deaths were returned from cholera, a death rate of 0.92 per 1,000. December is the month of highest incidence and August the lowest. Five mobile epidemic units, each of three sub-assistant surgeons, and six lorries were employed. In addition local doctors and sub-assistant surgeons were employed on cholera duty. Mass inoculation and disinfection of water supplies were the chief means adopted. 15,180 inoculations were done in all. 112,213 doses of bacteriophage were used during 1930, but no mention is made of how and where this was distributed and no opinion expressed as to its action or efficacy. In view of Lieutenant-Colonel J. Morison's interesting paper on cholera in the Nowgong district, a note on the subject from the Health Department would have been interesting.

The population of Assam in 1921 was 6,852,242; in 1931 the provisional figure is 7,910,457, an increase of 15.44 per cent. The birth rate, death rate and infantile mortality rates on the 1921 census were 31.35, 21.40 and 174.44 respectively.

The report is interestingly written and reveals the interest taken in the public health of the province by Lieutenant-Colonel Morison and his staff, and also their energetic activities.

REPORT ON THE SESSION OF THE OFFICE INTERNATIONAL D'HYGIENE PUBLIQUE HELD IN PARIS, OCTOBER 1931. BY LIEUT.-COL. A. J. H. RUSSELL, C.B.E., I.M.S. SIMLA: GOVERNMENT OF INDIA PRESS

INDIA figures largely in the discussions of the Office and great interest and attention is now paid to the work done in India on various diseases. Colonel Russell's note gives in particular the matters appertaining to Indian interests but mentions also other matters of some general interest. A very interesting discussion on the value of anti-plague inoculation took place. Italian and Egyptian experience has not been encouraging. Indian experience has been the reverse, and important notes on the matter by Major-General Graham, Lieutenant-Colonel Russell, Lieutenant-Colonel Dunn and Major-General Forster were laid before the session. The matter has two aspects, first the value of inoculation as a prophylactic, and secondly its value as a quarantine measure. From the point of view of the Office, the latter is the important question and Sir George Buchanan was quite clear in his opinion that no matter what value inoculation had as a prophylactic against infection, nothing was to be gained by enforcing inoculation of people leaving an infected country by ship or airship. Persia we believe demands such inoculation of healthy passengers. The notes if printed would be interesting. The matter is to be discussed again at the next session after the receipt of further information.

Cholera is of great importance to the Office. A note by Lieutenant-Colonel Morison on the use of bacteriophage as a prophylactic was read, and it is noted in this connection that this year at Tor, bacteriophage had proved 'immediately efficacious' in clearing up the vibrio-carrier condition. (It does not mention here what 'vibrio' is meant, rather an important point when there is no clear agreement yet as to what constitutes a cholera carrier.) In Italy, the opinion is apparently held that dates may carry cholera. It was noted that the Cholera Commission contemplated in India could not

now be undertaken on account of financial stringency. In Tor the presence of 4 cases of agglutinating vibrios had led to the pilgrimage being labelled 'suspect'.

Considerable attention was attracted by a paper by Colonel S. P. James, I.M.S. (retd.), on the chemo-prophylaxis of malaria. As is now known, Colonel James obtained very satisfactory results with plasmoquine in preventing the development of inoculated malaria, whereas quinine had entirely failed to do this.

Other matters of interest discussed were psittacosis, smallpox, post-vaccinal encephalitis, bills of health, and deratisation. In regard to the last item difficulties exist in India in issuing the necessary certificates on account of defects in the port inspection system.

NINETEENTH ANNUAL REPORT OF THE SUPERINTENDING ENGINEER, PUBLIC HEALTH DEPARTMENT (ENGINEERING BRANCH), BIHAR AND ORISSA, FOR 1930-31. SUPERINTENDENT, GOVERNMENT PRINTING, BIHAR AND ORISSA, PATNA, 1931. PRICE, RE. 1-3

The whole of India, both urban and rural, stands in need of two great environmental improvements—the provision of a safe and plentiful water supply and a safe and efficient system of excretal disposal. Both are difficult problems especially in rural areas, but until these two fundamental requirements are procured there is little hope of really getting rid of parasitic diseases like cholera, dysentery, and hookworm. Especially are they important in provinces where there are large pilgrimage centres. Bihar and Orissa is such a province, and the report of the Superintending Engineer shows that a great deal of attention is being paid in that province to water supplies. The water supply of Puri is of first rate importance. A detailed scheme costing Rs. 11,84,500 has been completed and work started on the construction of six 9-inch diameter tube wells. Up to the end of March 1931, four tube wells had been completed. The Patna-Bankipur supply is being extended. Grants for tube wells, pumps and overhead tanks for 12 smaller municipalities were made. Supervision and inspection of working water works form an important branch of the department's duties. Some information on the success or otherwise of such grants and schemes would be welcome in such a report. The information given in appendix IV is too meagre.

As regards excretal disposal, a scheme for the drainage and sewerage of Patna city was drawn up, the estimated cost being over fifteen lakhs of rupees.

REPORT OF THE EUROPEAN CONFERENCE ON RURAL HYGIENE, 1931. LEAGUE OF NATIONS. HEALTH ORGANISATION. GENEVA

DESPITE the spread of industrialism man still remains essentially a rural animal. His instincts and longings still turn to a country life as being the ideal existence. In the beginnings of industrialisation conditions in towns were appallingly bad; vice, poverty and alcoholism and disease produced a state of affairs beside which the old village life seemed idyllic. Chadwick initiated sanitary reforms in the towns and cities of England, and so successful has this been that city life in London, for instance, may be said to be healthier than in the majority of country places.

Pooling of common wealth resources in prosperous towns has made possible fundamental amenities like water supplies and sewage disposal on the best principles, while the best of medical and surgical skill has become available in the first class hospitals of large cities. It may be said that public health activities in England and Europe for the last hundred years have mainly been directed to towns; firstly because the problems in the towns were so urgent, and secondly because satisfactory solutions were demonstrably possible. So much so, that rural sanitation has been neglected, partly because of the tendency to regard village life as being of itself usually healthy, and also because of the inherent

difficulty of progress; moreover as compared with towns no special urgency seemed to be attached to health conditions in rural areas.

During and after the Great War, however, the problem of rural sanitation obtruded itself on the countries of Europe as one of the main tasks of reconstruction. Epidemics of malaria, cholera, typhus fever, and tuberculosis called attention to the necessity for consideration of the conditions in rural areas and their improvement. Closer investigation showed how difficult it was to improve water supplies, sewage disposal, and housing, deficiencies in which lead to the quick interchange of intestinal and other parasites which engender disease.

Poor economic conditions and the scarcity of money available in large widespread areas are the most formidable obstacles at the very outset, while administrative difficulties in sparsely populated regions form another. The problem has been treated in various ways and in different degrees by various countries of Europe. The League of Nations has done much to study conditions and problems in European states, and its advice and assistance have helped many countries to get going with schemes of sanitary betterment. At the request of the representative of Spain, a Conference on Rural Hygiene was held under the auspices of the League, and the present report is the outcome of the deliberations of this conference.

The conference agreed that the organisation of medical assistance, the formation of public health services, and the sanitation of rural districts formed the three chief subjects for investigation and report. They first formulated the principles, and then proceeded to make recommendations on these principles. Volume I contains the recommendations, and volume II records the minutes of the conference. The experiences of practically every country in Europe have been pooled and the report embodies the results of deliberations from as wide a view as possible. The recommendations have naturally to be of a general nature. This generally detracts somewhat from the value of the report and makes it rather resemble a series of copy-book headings and truisms of hygiene. Nevertheless the report is of very great interest and value and should assist countries in devising ways and means of improving conditions in rural areas under their control. The three main headings have already been indicated; the organisation of effective medical assistance in rural districts, the organisation of health services, and the most effective and economical methods of sanitation in rural districts. The resolutions of the conference are given in full with comments. Together they form a commentary on the methods in vogue in the various countries of Europe. All are agreed that effective medical assistance in rural areas is the primary essential to improving hygiene, doctors, nurses, and midwives come into this category, and small hospitals and laboratories are also considered necessary. As a means of realisation, health insurance in some form is recommended.

Public Health Services may be organised in two ways, one where the State administers, the second where the State has only supervisory functions. The first method is usually the best in poor and backward countries. A rural health district should have a minimum of one health officer, one public health nurse, a sanitary inspector and a clerk. The conference could make no recommendation of a model budget as conditions were so varied. Co-ordination of activities should be grouped together in rural health centres of two sorts, the primary health centre in villages, the secondary health centre at the headquarters of the rural administrative district. All health activities should centre in these, which will be under medical directors.

The section on sanitation reviews economic methods of water supply and sewage disposal but gives mostly general directions. On the mixed question of the ideal privy and its management it has not much new to say beyond recommending storage of fresh excreta long enough to destroy pathogenic organisms in water-tight

tanks. Housing in rural areas has long been neglected, town housing having dominated public attention. It suggests the improvement of rural housing by education, cheap credit and bettering the economic condition of the farmer by co-operation and legislation. Land improvement or bonification is mentioned and some particulars given of what Italy and the Netherlands have done in this respect.

The report is interesting as a presentation of a difficult and important problem and of suggestions for its solution.

In general terms it applies to India as well as to any other country, but conditions are so different in India and in many parts of India that only the generalities apply. It is a good example however of the fruitful results of collaboration between administrators of public health and medical assistance, agricultural experts, engineers, architects, medical officers and practitioners, representatives of health insurance associations, and public health organisers.

Little of this sort has of late years been attempted in India. Administrative departments are still very water-tight and jealous of each other, the Reforms Act has not yet produced the men of high ability and wider experience as popular ministers of health who should be able to co-ordinate all the nation-building departments into progressive unity of forward action. The improvement of rural sanitation in India is not the task of one department, but of every department, in fact it may be said to sum up in itself the whole real problem of Government in India.

Correspondence

ALOIN IN PREGNANCY

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I should be glad if you could give me information on the following points:—

- (i) Whether the action of aloes on the uterus as an emenagogue is solely due to the aloin in it, or to other constituents.
- (ii) If aloin administration is indicated in pregnancy.
- (iii) If a pregnant woman, after an attack of malaria, be given the following tonic pill—quinine hydrochloride grains 2, soamin grain $\frac{1}{2}$, and aloin grain $\frac{1}{2}$ t.d.s. p.c.—would it do any harm or not?

The most practical advantage of aloin is that the dose need not be gradually increased, and it always gives good results.—Yours, etc.,

P. B. SIRCIR.

BARAJAMDA,
SINGHRIHUM DISTRICT,
19th December, 1931.

[Note.—We have shown the above to Lieutenant-Colonel R. N. Chopra, I.M.S., who remarks that the emenagogue effect of aloin is an indirect one, by increasing the congestion of the pelvic organs. Aloin can be administered during pregnancy, but a certain amount of caution should always be exercised in its administration, especially during the last three months. Cascara and senna are better, as they are much less harmful.—EDITOR, J. M. G.]

THE MODE OF ACTION OF ATROPINE IN THE REDUCTION OF HERNIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In the December 1931 number of the *Indian Medical Gazette*, there is a report by G. R. Khurana on two cases of irreducible hernia reduced by administration of atropine. Similar cases have been reported in the *Gazette* previously, but as far as I am aware no rational explanation has been given as to the precise mode of therapeutic action of this drug in these cases. Such a rational explanation, I believe, is not

difficult. The normal physiological activity of the small intestine, which is the viscus usually herniated, is associated with general vaso-dilation of the intestinal blood vessels with increased blood flow, increased permeability of the capillary endothelium to transudation into the tissues, increased secretory activity of the intestinal glands and the increased peristaltic activity of the various intestinal muscular coats. Except in the latest stages there would be in strangulated hernia a pathological increase in these normal physiological activities of the intestinal canal. There are two well-known drugs that have a powerful inhibitory and antagonistic effect on the normal physiological activities of the small intestine, viz, adrenalin, the normal hormone, and atropine. Both these drugs inhibit intestinal secretory and peristaltic activities. They also cause vaso-constriction with changes in the permeabilities of the capillary endothelium in the opposite direction to that of its normal physiological activities. Vaso-constriction diminishes the volume of blood in the intestines. Changes in the permeabilities of the capillary endothelium tend to cause absorption of exudates of fluids distending the interstices of the intestinal tissues. Whether adrenalin or atropine tend to cause absorption from the intestinal lumen is doubtful, but possibly it may be so. At any rate the two vascular changes noted above, vaso-constriction and change in the permeability of the capillary endothelium, would cause diminution in the volume and the transverse diameter of the whole length of the small intestine. Decrease in the transverse diameter of the segments blocking the hernial ring if not permitting immediate reduction of the herniated bowel would at least relieve obstruction to venous and lymph flow, which relief of obstruction would result in further diminution in the volume of the herniated viscus. In these ways decrease in the transverse diameter and the volume of the herniated intestine would be effected which would perhaps convert an irreducible hernia into a reducible one.

This I believe is the mode of action of atropine in these reported cases. Instead of atropine, repeated injections of adrenalin may be tried as the effect would perhaps be better, as its vaso-motor action would be more powerful.—Yours, etc.,

SEBASTIAN L. RODRIGUES, B.A.,
M.B., B.S. (Bom.).

KARACHI,
29th December, 1931.

ANTI-MALARIAL MEASURES IN TRAVANCORE

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In your issue of December 1930, there is an original article entitled 'Five Years Anti-Malarial Measures on the Travancore Tea Companies' Estates' by Lieutenant-Colonel Clemesha and Dr. J. H. Moore. And in your issue of November 1931 there is an article by Colonel Clemesha entitled 'Further Note on Anti-Malarial Measures on the Travancore Tea Companies' Estates'. These two articles contain statements which (according to observations which I made on the estates, and recorded in my Diary at the time, and other evidence) are not true in fact; and they omit information without which it is impossible to estimate the relative value of the various factors which led to the improved health of the estates.

The argument in the notes is that anti-larval measures thoroughly carried out failed to give sufficiently good results; that as soon as plasmoquine was given in 1929 the health at once improved; and the conclusion is drawn that the improved health was the result of the plasmoquine, since no other factor affecting the health of the estate was different.

In the latest report Colonel Clemesha summarises the results from 1926–1932 and states:—'For all these years very thorough anti-larval measures have been carried out in all the estates', a statement contradicted by Colonel Clemesha himself in his first report, p. 674, where he describes a failure to control anopheles on one estate

in 1927 and on another in 1928. In his paper of December 1930 he states 'in both years (1928–1929) anti-larval work took place during the malarial season with equal vigour and with good results in both cases, the only difference being that in 1929 plasmoquine after-treatment had been in regular use for about 12 months and in 1928 it had not'. And he also says:—'All the natural conditions in the two years experiments are identical'. As I shall show these statements are incorrect.

The essential information omitted from the report is a statement of the size of the area controlled by anti-larval measures. It is obvious that until we know what area was so controlled, it is impossible to draw any conclusion as to how far any results obtained are due either to the anti-larval measures or the plasmoquine.

In Colonel Clemesha's report of 1930, the following will be found:—Sir Malcolm Watson says that 40 chains or half a mile is enough for *A. maculatus* breeding places in the F. M. S.*. But the report omits to mention that the area controlled by anti-larval measures on these estates was, on my recommendation, standardised as a circular area with a 20 chain (or quarter of a mile) radius. Before I left for India in 1928 I was invited by the Directors of the Travancore Tea Estates to visit their estates and make such recommendations as I considered necessary. In April 1929 I visited 8 out of the 9 estates referred to by Colonel Clemesha, examined all the children on each estate, and made a careful inspection of the anti-malarial work. I found that on certain estates the anti-larval work had not been efficiently carried out*; and that on some an insufficient area was being controlled, e.g., on one side of a group of buildings oiling was done for half a mile (40 chains) and on the other side for 5 chains or even less.

I have my notes, written at the time, before me as I write now; they describe what I found and what my recommendations were.

In order to put the anti-larval work on a more satisfactory basis it was necessary to decide at once what area should be controlled. At sea-level in Malaya, where malaria persists throughout the whole year, I have found that a half a mile was adequate. The same area has been found sufficient in certain parts of India at or near to sea-level. In the Travancore area, malaria disappears at an elevation of about 3,500 ft. The tea gardens referred to in this report ranged from 2,500 ft. to 4,000 ft. They were therefore near to the uppermost limit of malaria. The problem which confronted me was to decide what was the probable area which would eliminate malaria completely, and keep it permanently eliminated, by anti-larval measures alone. I decided that a circle with a radius of 20 chains or quarter of a mile should be tried. If it were found insufficient it could be increased. My recommendation was adopted, and I have here beside me plans of all the Estates showing the areas controlled by anti-larval measures.

When I saw Colonel Clemesha in Ceylon about a month later, I told him that I had found the anti-larval control unsatisfactory in places, and also that I had standardised the area of anti-larval work to 20 chains. Colonel Clemesha's report contains nothing of this, so he has evidently forgotten it. Yet it is of vital importance if we are to understand the reason for the improvement of health which took place in 1929.

The adoption of plasmoquine after-treatment was, therefore, not the 'only difference' between 1928 and 1929, and in view of the facts that I have stated, it cannot be regarded as the factor responsible, or even mainly responsible, for the improvement of health.

The improvement in health is what might be expected from, and did in fact follow, the better organisation of the anti-larval work introduced by Mr. Cantlay, partly on his own initiative and partly on my advice, on all the estates in May 1929, and since continued by

*Facts which had already been reported to the Directors by Mr. Cantlay, who was in charge of all the Estates at the time of my visit.

Mr. Sylvester. The greatest credit is due to Mr. Sylvester and Mr. and Mrs. Cantlay for the work they have done. In giving credit to them I am in agreement with Colonel Clemesha.

I find myself in agreement with Colonel Clemesha on one other point. It is the value of euquinine and sweetened condensed milk treatment for children. He calls it a *new weapon*. I used it more than 20 years ago as Colonel Clemesha will find by referring to the first edition of my *Prevention of Malaria in the Federated Malay States* published in 1911.

Finally, I would like to make it quite clear that this letter is not an attack on plasmoquine or any other anti-malarial drug. They have a more or less important place in all campaigns against malaria, and I have employed them and all other methods extensively in the past and sought to determine their values and limitations as my books and papers show. In some regions drugs should be used to supplement the anti-larval measures until the anti-larval measures by themselves are thoroughly organised, and are able to prevent the further spread of the disease. In other regions drugs will not be supplemental to anti-larval measures; they will be the method of choice, and anti-larval measures will not be used. The dividing line between the two regions has still to be determined and I hope it will be my privilege to take part in this research.

Here I wish to take the opportunity of acknowledging the courtesy of Dr. Schulemann, Director of Messrs. Bayers Research Department, the inventors of plasmoquine, when I visited him at Elberfeld in Germany, and with whom I am in close communication in the researches now being carried out at the Ross Institute; but what I wish to bring out here is that Colonel Clemesha's report is misleading, both in what it states and in what it omits, and so it does not help us to get nearer to the truth about the value or limitations of either plasmoquine or anti-larval measure.—Yours, etc.,

MALCOLM WATSON,
Director of Tropical Hygiene.

THE ROSS INSTITUTE,
PUTNEY HEATH,
LONDON, S.W. 15,
23rd December, 1931.

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Many thanks for allowing me to see the letter from Sir Malcolm Watson concerning our work in Travancore.

In 1925 I visited the Travancore Tea Companies' Estates and spent about four weeks investigating malarial conditions. In the malaria season of 1926 the company agreed to my being there for a period of six weeks to start anti-larval and other measures. In 1927 I spent four weeks on these estates helping with the work and supervising all arrangements, particularly the oiling, which was on the whole very well carried out. Dr. Moore was stationed in this area for the whole period and gave valuable help, especially with the treatment. In 1927 I came to Ceylon and have not been able to visit the estates since.

In 1928 Sir Malcolm Watson paid a visit of five or six days only to the estates; leaving Travancore he came to Ceylon where he visited me. He was very reticent about any recommendations that he had made in Travancore, but remarked that on one or two estates he recommended extending the area to be oiled. On the 11th of June, 1929, I wrote and asked him, would he kindly let me have a copy of any report that he might be writing on the Vandiperiyar estates, as I was interested in them; on the 2nd August, 1929, he replied as follows:—

'MY DEAR CLEMESHA,
Some time ago I got a letter from you asking if I would send you a copy of any recommendations I made about the Vandiperiyar. I have not made any written report about... but some time ago

Mr. Sylvester, the Manager, came to the Institute and discussed the estates with me.

As you know Mr. and Mrs. Cantlay have done such good work (Carrying out my orders.—W. W. C.) that there was little to say on the subject. I think my only recommendations were that a definite area of a quarter of a mile, round the lines, should be selected and controlled on each estate, and on one of the estates, Tungumullay I think, I suggested that some land should be acquired from the Government in order to complete the control work.

It was, I think, Tungumullay where a swamp immediately below the lines and one or two other breeding places, had not been controlled, and to these places I attribute the last outbreak of malaria.

(This was ordered to be done by me, but the old dispenser got past his work.—W. W. C.)

From the above it is obvious that at the time Sir Malcolm Watson himself did not consider that the slight increase in the area oiled was of very great importance. He now claims that this increase in the area oiled was the cause of the rapid decline in the malaria figures in 1929. Admitting that the area oiled was increased slightly, as was desirable, does he maintain that this would have reduced the percentage of parasites in the autumn blood slides from 73 per cent. to 7 per cent. and the gametocyte percentage from 34 per cent. to nil in a year? There is conclusive evidence that our anti-gametocyte campaign, making use of Plasmoquin, produced a very drastic reduction in the number of gametocyte carriers in the labour forces of the estates; therefore to say that this was not the main cause of the reduction in the number of re-infections and to attribute it to a very doubtful reduction in the number of anopheles is simply to acknowledge one's ignorance of mathematics. The area oiled was only increased in two estates, yet all showed improvement in the health figures. Further it is possible to omit the figures on the two estates mentioned without upsetting my conclusions. Both Mr. Cantlay and Mr. Sylvester have informed me that there was practically no alteration in my original programme. Anyhow all the evidence and figures... detail in the first article (December, 1929, III; IIIa and IV, IVa; they are there for everybody to see and I can confidently leave the final judgment to the readers of the Indian Medical Gazette.

Plasmoquin assists the malariologist in the following ways:—(1) In minute doses given to the gametocyte carriers, it prevents the infection of mosquitoes (Barber, Komp and Newman, 1929); (2) in medium doses, 0.06 of a gramme spread over 3 days, it removes gametocytes from the blood (Knowles, and Das Gupta, 1931, and others); (3) in somewhat larger doses, which have not yet been accurately determined for orientals, it prevents the infection after injection of sporozoites (James, Shute and Nicol, 1931); (4) in two treatments, 0.06 of a gramme over a week, it prevents relapses, reduces the number of carriers in a force and so reduces the number of infections (Clemesha and Moore, 1930).

The drug which has this remarkable action was given with very great care in accordance with my suggestions on all these estates, commencing September 1928, and yet it is claimed that a slight increase in the area oiled (at the very outside of 10 or 15 per cent. on 2 estates out of 9) was responsible for the reduction in the amount of sickness on these estates.

I shall shortly be publishing some very interesting graphs of badly-infected estates in Ceylon which have been kept practically free from malaria for more than two years by anti-gametocyte dosing with Plasmoquin alone, anti-larval measures being impossible on these estates.

I do not propose to say much concerning the area to be oiled. In flat countries very likely the arrangements propounded by Sir Malcolm Watson answer satisfactorily in most years, but in mountainous countries, such as the Vandiperiyar Valley, they are useless. Anybody with an elementary knowledge of the habits of anopheles in hilly countries is well aware that

these mosquitoes keep to the bottom of the valleys and are also capable of travelling very long distances up and down ravines. Neither 20, nor 40, nor a much larger number of chains are adequate to prevent invasion from outside in this type of country.

I do not propose to discuss the last two paragraphs of Sir Malcolm Watson's letter. Anyone may search the book *Prevention of Malaria in the Federated Malay States* from cover to cover and he won't find the term 'anti-gametocyte campaign', or very little that is in any way synonymous with it.

Five years hence when we know a little more about the uses and possibilities of Plasmoquin, I think Sir Malcolm Watson's letter will cause a smile, and will be looked upon by the scientific world in much the same spirit as his pronouncement on Plasmoquin at the meeting of the Industrial Anti-malarial Advisory Committee of the Ross Institute, which you discussed in your leading article of November 1931.

There is one question which I would like to ask Sir Malcolm, namely, what was the cause of the complete break-down of his oiling measures on the estates in the Federated Malay States in 1926? I have before me three reports of medical officers in that country; they all agree as to the facts, namely, that in spite of the most careful oiling, practically the whole of the labour force of estates was seriously infected throughout the whole Peninsula. I think I know the correct answer to this question, but I should like to know what so eminent an authority as the writer of the above letter thinks on the same subject.—Yours, etc.,

W. WESLEY CLEMESHA,

LIEUTENANT-COLONEL, I.M.S. (ret'd.).

MALARIA CONTROL SCHEME,
'DAYTONA', KANDY,
20th February, 1932.

[Note.—The decline in the art of polemics is in the opinion of some a sign of the decadence of the present age. We do not feel certain as to the cause, but the evidence of the decline, as far as medical polemics is concerned, is certain. Is it because none of us feel able to 'throw the first stone', or is it because we are afraid of reprisals and prefer to scratch each other's back, or is it simply that we are less barbaric and more polite than we were? Our forefathers did not display this feebleness or delicacy, whichever it is, and if one turns over the pages of the early volumes of this *Gazette* one will seldom find a number in which some surgeon-captain does not deplore the lack of common sense or of professional acumen displayed by some surgeon-major, who retaliates vehemently in the next number.

It is one of our principles in this journal to avoid politics, or any discussions that are likely to take a political turn, but this does not mean that we are not prepared to engage in scientific polemics, and, in fact, we have from time to time been disappointed that our expressions of somewhat heterodox opinions have not been challenged. It is no fun to carry on a one-sided argument. Much good to both parties often comes out of a discussion, even when strong words are exchanged; and the general reader must inevitably be the gainer by hearing both sides of a question. There are of course certain rules which should be observed—for example, care should be taken to say nothing that is in any way derogatory to the medical profession in general—or to any section of it—and to avoid accusing one's opponent or opponents of deliberate deception. Again, great care should be exercised when any statements are made that may have a legal application, and of course irrelevant personalities must be avoided.

We are therefore only too pleased to print Sir Malcolm Watson's letter, but as it had appeared in two other papers in England we felt that for the benefit of our readers we should like to print Colonel Clemesha's reply at the same time, and like the Irishman, we hope that this is 'not a private fight and that it is permitted to join in'.

As consulting malariologist to a group of gardens, Colonel Clemesha made a survey of conditions, made

certain recommendations, and himself instituted certain anti-larval measures during the years 1925, 1926 and 1927. The measures thus instituted were continued with the advice of Dr. Moore, who was resident in the district, and both Sir Malcolm and Colonel Clemesha agree that the managers of the estates carried out the anti-malarial measures with considerable energy and enthusiasm. Nevertheless the results were not up to expectations. Sir Malcolm during a tour in India visited these gardens and, being an enthusiast on anti-larval measures, by a process of rationalization, decided that there must be a chink in the anti-larval armour; this he found and suggested its repair. The evidence that it was repaired satisfactorily and that other chinks did not appear in that very delicate structure seems to be lacking, as Sir Malcolm did not again visit the gardens but subsequently advised the management from his armchair on Putney Heath. Meanwhile, also in 1928, Colonel Clemesha and Dr. Moore, whilst the anti-larval measures were being continued, instituted anti-gametocyte measures with Plasmoquin. There was a marked improvement in the health of the coolie forces during the years 1929 and 1930; this Colonel Clemesha and Dr. Moore reasonably impute to the Plasmoquin. They certainly omitted to mention specifically Sir Malcolm's visit and his recommendations, but apparently they did not attach any great importance to these as they no doubt felt sure that, observing the usual etiquette, Sir Malcolm would have informed them had he suggested any extensive modification of their anti-larval policy. Sir Malcolm with characteristic modesty suggests that they forgot his visit; this we think hardly likely.

Of course, we see Sir Malcolm's point of view; he descended upon the gardens and said 'There shall be no larvæ'; and it was so. Apparently he was there only a very short time, but after all much can be achieved even in a short time by the right person. Naturally, in his opinion the improvement in the health of the labour force was due solely to his visit, though he modestly acknowledges the help of the manager and his wife.

Let us try to take an impersonal point of view. Anti-larval measures were instituted and put into practice by an acknowledged expert, but for three years they did not produce entirely satisfactory results. The next year two things happened; a super-expert—shall we say—visited some of the gardens, and at the same time anti-gametocyte measures were instituted in all the gardens; the result was a marked improvement in health on all the gardens. It is apparent that the anti-gametocyte plus anti-larval measures controlled malaria in those gardens over which the super-expert's wand was not waved; therefore, as anti-larval measures alone carried out by just ordinary experts are liable to be defective—and did in fact fail to control malaria in these gardens—we feel that the case for giving anti-gametocyte measures with Plasmoquin a trial has been made out.

To return to Sir Malcolm's letter, the relevance of his concluding paragraph is not quite clear, but we must congratulate him on having discovered Elberfeld and on the exhibition of the prodromal symptoms of conversion to Plasmoquin as a possible anti-malarial weapon. From another source we understand that Sir Malcolm has sailed for Africa armed with some new preparations from Dr Schulemann's laboratory. The prospects of hearing about his results will add a new zest to the opening of our morning paper.

Referring to Colonel Clemesha's list of ways in which Plasmoquin can assist the malariologist, whilst agreeing with him as to the great value of Plasmoquin we must point out that the experiments of James, Shute and Nicol in this connection are of little more than academic interest, as in practicable doses this drug has little or no personal protective action against malarial infection, and in fact small doses appear to have a provocative action, tending to precipitate an attack.—EDITOR, I. M. G.]

Service Notes

APPOINTMENTS AND TRANSFERS

LIEUTENANT-COLONEL A. H. PROCTOR, D.S.O., Surgeon Superintendent, Presidency General Hospital, Calcutta, is appointed as Professor of Surgery, Medical College, Calcutta, and Surgeon to the College Hospital, *vice* Lieutenant-Colonel W. L. Harnett.

Lieutenant-Colonel E. H. V. Hodge, Civil Surgeon, Jalpaiguri, is appointed as Professor of Medicine, Medical College, and First Physician to Medical College Hospital, Calcutta, *vice* Lieutenant-Colonel J. D. Sandes.

Lieutenant-Colonel K. S. Thakur, Civil Surgeon, Howrah, is appointed as Civil Surgeon, 24-Parganas, *vice* Lieutenant-Colonel A. Denham White.

Major H. E. Murray, on leave, is appointed as Surgeon Superintendent, Presidency General Hospital, Calcutta, *vice* Lieutenant-Colonel A. H. Proctor.

Major S. A. McSwiney was appointed as Civil Surgeon of Darjeeling, with effect from the 6th December, 1930.

Lieutenant-Colonel C. M. Plumptre is appointed to officiate as Presidency Surgeon, Bombay, during the absence on leave of Lieutenant-Colonel A. N. Thomas.

The services of Captain M. G. Kelly are placed at the disposal of the Government of Burma for employment in the Burma Jail Department, with effect from the 9th November, 1931.

The undermentioned officer is confirmed in the rank of Captain:—

Captain (Provl.) L. G. Backhurst.

The following appointments are made subject to His Majesty's approval:—

To be Captains (on probation)

G. D. Malhoutra. Dated 17th March, 1930, with seniority 16th April, 1922.

B. P. Baliga. Dated 21st March, 1930, with seniority 17th June, 1922.

R. K. Tandon, M.B., I.M.S. (T.C.). Dated 20th May, 1930, with seniority 15th September, 1922.

B. R. Tandon. Dated 27th March, 1931, with seniority 25th August, 1923.

M. S. Gupta, I.M.S. (T.C.). Dated 27th April, 1931, with seniority 2nd November, 1926.

A. N. Chopra. Dated 2nd March, 1930, with seniority 17th October, 1927.

D. N. Chakravarti, I.M.S. (T.C.). Dated 27th April, 1931, with seniority 10th December, 1927.

T. B. Pahlajani, I.M.S. (T.C.). Dated 27th April, 1931, with seniority 15th June, 1929.

Assa Singh, I.M.S. (T.C.). Dated 27th April, 1931, with seniority 20th November, 1929.

S. Annaswami. Dated 18th May, 1931, with seniority 10th February, 1930.

To be Lieutenants (on probation)

R. R. Bakshi, I.M.S. (T.C.). Dated 12th February, 1930, with seniority 19th August, 1927.

B. D. Khurana, I.M.S. (T.C.). Dated 20th May, 1930, with seniority 28th October, 1927.

D. C. Chopra, I.M.S. (T.C.). Dated 20th May, 1930, with seniority 19th November, 1927.

J. Singh, I.M.S. (T.C.). Dated 20th May, 1930, with seniority 19th November, 1927.

A. K. Gupta. Dated 7th March, 1930, with seniority 15th July, 1928.

V. Srinivasan. Dated 2nd April, 1931, with seniority 25th August, 1928.

D. P. Mitra, I.M.S. (T.C.). Dated 20th May, 1930, with seniority 1st September, 1928.

T. D. Ahmad, I.M.S. (T.C.). Dated 23rd October, 1930, with seniority 6th October, 1928.

M. Jafar, I.M.S. (T.C.). Dated 23rd October, 1930, with seniority 9th October, 1928.

A. M. Chaudhuri. Dated 6th March, 1930, with seniority 6th November, 1928.

S. Lal. Dated 13th May, 1931, with seniority 10th February, 1929.

P. V. Bamford. Dated 25th April, 1930, with seniority 15th July, 1929.

H. D. R. Zscherpel. Dated 25th April, 1930, with seniority 15th July, 1929.

K. Jilani, I.M.S. (T.C.). Dated 27th April, 1931, with seniority 26th July, 1929.

J. R. Dogra. Dated 15th November, 1930, with seniority 25th August, 1929.

F. M. Khan, I.M.S. (T.C.). Dated 23rd October, 1930, with seniority 3rd October, 1929.

D. Datt, I.M.S. (T.C.). Dated 23rd October, 1930, with seniority 10th October, 1929.

M. G. Saincher, I.M.S. (T.C.). Dated 23rd October, 1930, with seniority 12th October, 1929.

S. W. H. Askari, I.M.S. (T.C.). Dated 23rd October, 1930, with seniority 3rd January, 1930.

D. P. Nath, I.M.S. (T.C.). Dated 27th April, 1931, with seniority 21st May, 1930.

S. Narain. Dated 17th November, 1930, with seniority 25th August, 1930.

P. L. Taneja, I.M.S. (T.C.). Dated 27th April, 1931, with seniority 19th November, 1930.

H. M. Sein, I.M.S. (T.C.). Dated 27th April, 1930, with seniority 26th January, 1931.

H. H. Mahmood. Dated 22nd May, 1931, with seniority 10th February, 1931.

(Army Department Notifications Nos. 501 and 502, dated 27th September, 1930, No. 517, dated 4th October, 1930, No. 107, dated 21st February, 1931, No. 289, dated 16th May, 1931, No. 457, dated 25th July, 1931, No. 539, dated 12th September, 1931, and No. 707, dated 5th December, 1931, so far as they relate to the above named officers, are hereby cancelled).

LEAVE

COLONEL H. M. MACKENZIE, Inspector-General of Civil Hospitals, Punjab, is granted leave preparatory to retirement on average pay for 1 month and 16 days, with effect from the 28th March, 1932.

Lieutenant-Colonel A. N. Thomas, D.S.O., Presidency Surgeon, Bombay, is granted leave for 7 months and 15 days, with effect from 2nd April, 1932, or subsequent date of availing.

Lieutenant-Colonel A. Denham White, Civil Surgeon, 24-Parganas, is granted leave on average pay for 6 months, with effect from the 15th March, 1932, or the date of availing.

Lieutenant-Colonel W. L. Harnett, Professor of Surgery, Medical College, Calcutta, is granted leave for 6 months, with effect from the 11th March, 1932, or the date of availing.

Lieutenant-Colonel J. D. Sandes, Professor of Medicine, Medical College, and First Physician, Medical College Hospital, Calcutta, is granted leave for 6 months, with effect from the 22nd March, 1932, or the date of availing.

Brevet-Colonel F. P. Mackie, O.B.E., K.H.S., Officiating Director, Pasteur Institute and Medical Research Institute, Shillong, is granted preparatory to retirement leave for 1 month and 12 days, with effect from the 7th January, 1932.

Major F. R. Thornton, M.C., Civil Surgeon, Coorg, is granted leave for 8 months, with effect from the 29th March, 1932, with permission to prefix the Easter holidays to his leave.

PROMOTIONS

Majors to be Lieutenant-Colonels

Dated 27th January, 1932

J. W. Jones, D.S.O.

L. A. P. Anderson.

W. C. Paton, M.C.

J. B. Hance, O.B.E.

H. K. Rowntree, M.C.

B. F. Eminson.

A. Kennedy.

C. McIver.
J. C. John, O.B.E.

The following promotions are made subject to His Majesty's approval:—

Lieutenants to be Captains

D. Tennant. Dated 1st September, 1931.
H. T. McWilliams. Dated 4th February, 1932.
W. P. Lappin. Dated 4th February, 1932.

Lieutenant (on probation) to be Captain (Provl.)
(on probation)

R. R. Bakshi. Dated 19th August, 1930.
Lieutenant (on probation) to be Captain (on probation)
A. M. Chaudhuri. Dated 6th November, 1931.
Lieutenant to be Captain (Provl.)
J. H. Gorman. Dated 4th February, 1932.

RETIREMENTS

Lieutenant-Colonel W. D. Wright retired on 21st December, 1931.
Lieutenant-Colonel H. Halliday. Dated 17th April, 1931.

Notes

AN ELECTRIC OPHTHALMOSCOPE

By N. BISHOP HARMAN, F.R.C.S.

THE optical part of this ophthalmoscope was shown to the Ophthalmological Society of the United Kingdom in 1904, a description of the mechanism was given in the *Lancet* (1905, II, p. 28).

Recently, Messrs. Rayner (who had acquired the original patterns) asked me if I would supervise the adaptation of the original reflecting ophthalmoscope to a self-contained electric fitting.

The new model has certain advantages. The attachment of a battery handle to a magazine ophthalmos-

cope, such as Couper's or Morton's adaptation thereof, produces an inconveniently long instrument. This new ophthalmoscope, although it has a range of 70 dioptries, from +30 to -39 in steps of 1 dioptre, is no longer than a May's ophthalmoscope with its small range of lenses.

The range of 70 dioptries is produced by 15 actual lenses. The mechanism which I adapted to this ophthalmoscope was invented by Harding, an engineer of Leeds, about 1870. It is thoroughly reliable. It has been extensively used in speed indicators, meters, and stop-watches. The first of these ophthalmoscopes, made in 1903, I have used regularly since then, it has never got out of order.

There are two lens discs. These overlap at the sight hole. The larger, or 'units' disc, has ten holes, one blank and nine glazed from -1 to -9 dioptries. As one point on the rim of this disc there is a finger-like projection. The smaller, or 'tens' disc, has seven holes, one blank, the others glazed +10, +20, +30, -30, -20, -10 dioptries. On one face of this 'tens' disc is a spur wheel of seven teeth. As the driving wheel is turned past 9 dioptries, the 'finger' of the 'units' disc automatically engages with the spur wheel and moves the 'tens' disc one place either way, according to the movement of the driving wheel. The edge of the 'tens' disc is milled, and one part is exposed through the edge of the body of the instrument, so

that it can be turned directly to bring a strong convex lens to the sight hole.

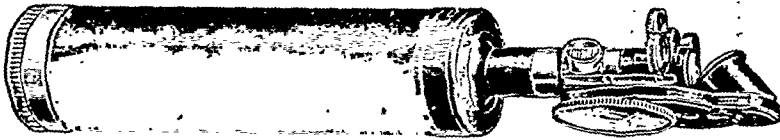
In providing an electrical attachment, the aim has been to secure the widest, most variable, and most stable range of illumination. The battery supplying the lamp is a standard 'Eveready' pattern No. 1829. It will keep the lamp burning continuously for over 13 hours, still giving sufficient illumination for examination of the fundus: continuous discharge is a severe test. The lamp is gas-filled, and has a small coil filament.

A focusing lens, controlled by an external collar, regulates the beam from the instrument. When the collar is at the bottom position, a slightly diverging beam giving the effect of a plano mirror retinoscope is produced. As the collar is moved upwards the beam becomes converging, until a very short focus is reached, after which the beam becomes increasingly divergent. At a distance of one inch the illumination varies from considerably over 100 foot-candles with the filament almost focused, to about 30 with the most widely-divergent beam. By using the resistance in the circuit the divergent beam can be reduced to 2 foot-candles. Great care has been taken to ensure a fine control of the focusing movement.

Four cells are hinged to the lamp tube and can be interposed between the light and the mirror. They contain filters, red, green, and 'daylight', and a diaphragm with a small central hole. These screens can be readily brought into use and are very serviceable.

The instrument is excellent for retinoscopy at the distance of one metre, either with the white or red light. It has proved itself to be a first-rate emergency operation lamp, since it will throw a beam of parallel rays of about 20 foot-candles from a distance of 6 inches which will illuminate the eye and lids; and as the ophthalmoscope is held horizontally above the eye it is easy to keep it in position and out of the operator's way.

Finally, mention may be made of the covering of the handle which contains the battery. This is coated with an even layer of fine sand which gives a perfectly easy grip. The instrument can therefore be held easily



with the fingers with no sense of risk of slipping and without the damp chilly feeling which comes to leather-covered handles after much usage.

The instrument is packed in a case with an arrangement which allows of its immediate extraction when it is required.

X-RAY FILMS

WE hear that the contracts for some of the government and other hospitals have been placed this year for the new Ilford super x-ray film. The Ilford concern has maintained from the early days of photography a reputation throughout the world for the excellence of their photographic emulsions, so much so that the history of the Ilford company is almost a romance. In recent years Ilfords have especially improved all panchromatic grades of emulsions and have now placed on the market their super x-ray film. The speed of this new film is very great, and its contrast, latitude and clean working are remarkably good. We are told the film has been under test in India for some time past and that its keeping qualities in this climate are exceptional.

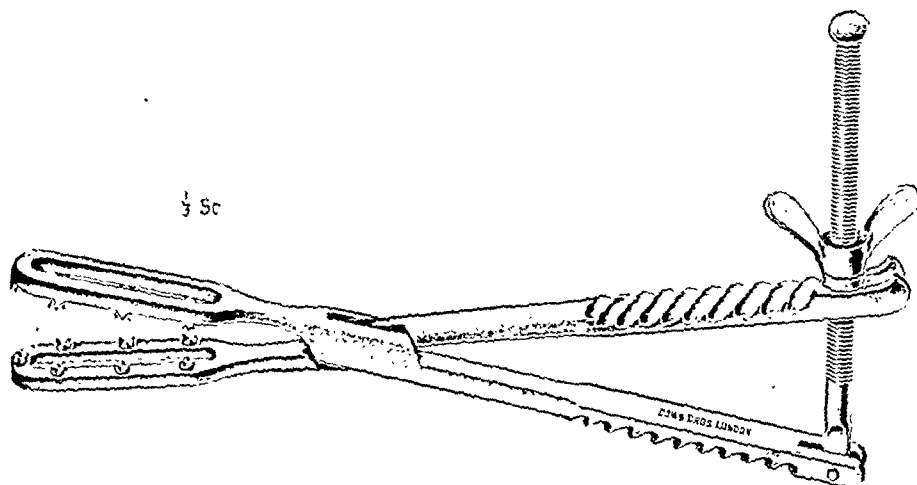
Messrs. Houghton-Butcher (Eastern), Ltd., are the agents and distributors in India and films are kept in

cold storage in their Calcutta premises at 10, Hungerford Street.

A NEW CRANIOTOMY FORCEPS

By DR. MILLICENT VERE WEBB
Women's Medical School, Agra, U. P.

Messrs. Down Bros. have recently made at my request a special pair of craniotomy forceps designed to meet the requirements of those who practise obstetrics in India.



The chief points to which I would draw attention are:—

(1) Its lightness and small size, enabling it to be applied in a small pelvis.

(2) The ease of application owing to its fixed joint.

(3) The firm grip obtained by the special teeth. These were suggested to my mind by Rivett's vulsellum.

I wish to emphasize the point that this forceps is designed as a tractor; it is not intended for use in crushing the head.

The majority of cases even in India can be delivered after perforation and washing out the brain if a firm grip can be obtained. In Agra and the district the people have learnt the advantages of Cæsarean section, and craniotomes are comparatively rare. But on the occasions when I have used them I have been more than satisfied with the advantage of this forceps over any other I have tried.

THE INJECTION TREATMENT OF VARICOSE VEINS

ALTHOUGH the treatment of varicose veins by injection is a comparatively recent innovation it is already adopted as the standard procedure, being regarded generally as coming within the scope of ordinary clinical practice rather than belonging to the category of a surgical operation. The solution which is injected must be non-toxic, and, whilst it should produce as little pain as possible, it must necessarily be sufficiently irritating to cause the desired endothelial damage.

In this connection two preparations by the British Drug Houses, Ltd., are of interest. The first is their Sodium Morrhuate, B. D. H. This is claimed to be a chemically pure product, non-toxic even in large doses, rapid, safe and reliable in its local action, almost painless on injection, and without risk of periphlebitis or necrosis. The solution usually used is a 5 per cent. one and is most effective when injected into a distended vein; hence the standing position is generally adopted except in the case of very large veins. A pneumatic tourniquet is applied above the line of the vein to be treated, and a fine needle and all-glass syringe are used. A series of injections are given throughout the length of the vein from above downwards; the punctures seal themselves and there is no extravasation. The dosage is usually 0.5 c.cm. of a 5 per cent. solution for

each injection; the total dosage not to exceed 10 c.cm., usually less is sufficient. Sodium Morrhuate, B. D. H., is issued in 20 c.cm. rubber-capped phials in 5 per cent. solution, also in 2 c.cm. and 5 c.cm. ampoules.

The second preparation is Quinine and Urethane Solution, B. D. H. With this care must be exercised in the selection of patients, since some are intolerant to quinine, whilst pregnancy and menstruation constitute contra-indications. The injection is carried out in a manner similar to that with sodium morrhuate, but the patient should be in the recumbent position. After injection the needle is held in position for about

30 seconds, then withdrawn and the puncture sealed with collodion. The dosage for 2 to 3 inches of affected vein is 0.25 c.cm. of the solution, and not more than 2 c.cm. should be injected at one sitting. The solution is issued in ampoules of 2 c.cm., and also in rubber-capped vaccine bottles of 30 c.cm.

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Original Articles

RHEUMATISM IN INDIA

By E. H. VERE HODGE, M.D. (Cantab.)
M.R.C.P. (Lond.)

LIEUTENANT-COLONEL, I.M.S.
Civil Surgeon, Jalpaiguri

CURRENT medical literature on diseases in the tropics or hot countries is, on the whole, silent on the subject of rheumatic infection though there seems to be ample evidence that the disease, as far as India is concerned, is by no means rare and is a potent, though not necessarily the most prominent, factor in the production of heart disease. There seems to be some diversity of opinion, though most practitioners consulted by the writer state that they have seen unmistakable cases of rheumatic fever, some of them in considerable numbers.

Clark (1930), after an exhaustive study of available records, suggests that the disease is practically non-existent in the tropics. He confines his observations to the strict geographical tropics and though he quotes the evidence of Calvert and Sutherland to the effect that they have seen rheumatic fever, chorea and nodules in Indian children, though they regard such conditions as rare, he disqualifies this evidence on the grounds of geographical limits. He further quotes Rogers as stating that out of 4,800 post-mortem examinations performed in Calcutta, only one showed rheumatic carditis. This observation is strikingly at variance with the clinical experience of most practitioners.

Other observers have of late years raised the question and concluded that rheumatic fever is responsible for a definite proportion of the heart disease which is unquestionably common. Basu (1925), investigating 446 cases of heart disease in Calcutta, attributed 21 to rheumatism. Hughes and Yusuf (1930) report 31 cases of heart disease admitted to the Mayo Hospital, Lahore, in seven months, of which 23 were mitral disease or mitral combined with aortic. They observed several cases of arthritis combined with carditis, responding, but less readily than European cases, to salicylates, and record the opinion that in the Punjab, rheumatic fever is an important cause of mitral stenosis. They have not seen chorea or nodules.

Stott (1930) from Lucknow states that acute rheumatic arthritis does attack young Indian adults and gives it as his opinion that unrecognized subacute infection is the probable cause of mitral disease in young Indians.

In Bengal the incidence of rheumatic fever is generally accepted. Enquiry from responsible

practitioners in mofussil towns elicits the fact that the disease is rare, though they treat cases from time to time. The dispensary returns are misleading; the figures given under the heading of rheumatic fever treated in the out-patient departments are formidable and it would seem that the term is loosely applied to all forms of joint disease. There is, however, evidence that a certain proportion are genuine rheumatic fever with carditis. It must be remembered that in many of these institutions there is no accommodation for in-patients, so the treatment is out-door or none at all.

The writer has seen a number of unmistakable cases of rheumatic fever, in which the final result to the heart was often disastrous, in Chittagong, Chinsura and Darjeeling. Cases in the latter district need not be discounted on the grounds that a hill-station does not come into the discussion. Admittedly the climate is peculiarly provocative of manifestations in the infected child, but practically all cases gave a history of previous attacks in the plains or a family history that some close relation had suffered in the plains.

In India, the difficulties in assessing the prevalence of rheumatic infection are manifest. Many fully authenticated cases of rheumatic fever are recorded in different provinces, but there is no record of infections other than of the more obvious type.

On the analogy of European experience, the juvenile type should be more common. In this type the joint pain and swelling is often slight or fleeting, pyrexia is not marked and the full significance of the case is apt to be realized only when some degree of carditis is established. Further, carditis may be of such a minor degree that it passes unnoticed until, with the passage of years, some definite disability of the heart is established and by this time, the other rheumatic manifestations, often far from prominent, have been forgotten. Until such time as children's clinics are established in India and the poorer classes, among whom rheumatic infection is likely to occur, have realized the importance and value of medical advice in what are apparently minor degrees of ill-health, so long shall we be unaware of the prevalence of rheumatic infection in this country and so long will many cases come under treatment only when the heart is failing.

That heart disease is exceedingly prevalent all are agreed. Lieut.-Col. Chopra informs me that towards the end of the War he made the final examination of between 50,000 and 60,000 recruits and formed the opinion that at least 1 per cent. were suffering from some form of heart disease. Experience in hospitals confirms this view; patients with heart disease fill a considerable proportion of the beds. Again, those who have had occasion to examine candidates for government service cannot fail to be struck with the incidence of mitral disease,

tenderness in the knee joints and low fever. The movements, except for occasional twitching of the trunk, remained strictly confined to the left side. The severity of the infection was demonstrated by the development of anaemia and mitral incompetence. The boy was moved down from the hills at the onset of the cold weather and the ultimate developments are unknown.

Case 6.—P. Ch., Hindu male, aged 47. He states that at the age of 12 he suffered from rheumatic fever and was considered to have made a good recovery, but the heart was further injured by epidemic dropsy. He considers that during adolescence he further strained his heart by over-indulgence in athletics. The mother suffered from rheumatic fever at an early age.

The heart is enlarged, mitral stenosis present, but there is a fair degree of functional competence. In June 1928, while bicycling, the patient suddenly developed paralysis of the right arm and leg with complete loss of speech. Judging from the complete and rapid recovery from this attack and the course of the subsequent attacks, it would seem that the condition was one of cerebral claudication. After twenty-four hours the power of speech returned, but recovery in the arm and leg was slower and it was fifteen days before full power returned. Even after this, any prolonged exercise in writing induced mental exhaustion. In March 1929 there was a recurrence, this time affecting the right leg only, of seven days duration. The third attack in August 1930 took the form of loss of memory.

The fourth attack in April 1931 was manifest paralysis of the left leg which persisted in some degree for two months but ultimately passed off. At this time advanced cardiac failure was evident; this persisted until the patient's death in August. During the last month of life there was a mental change culminating in definite insanity with hallucinations.

Case 7.—A. H., European girl, aged 10. The patient had suffered from a mild attack of chorea some six months previously, preceded by an erythema all over the body. The mother and one cousin are known to have suffered from rheumatic fever. The child had suffered from measles and pneumonia at the age of three and the tonsils had been removed at the age of seven. The present attack is severe and began while the child was at a boarding school. The movements were violent and speech was lost. In addition, there was definite psychic alteration in the direction of irritability. Anaemia was progressive, but throughout the illness there was no evidence of cardiac involvement. Progress was slow under the routine treatment with chloral, bromides and arsenic and there was but slight improvement after a month's treatment. At this time, calcium lactate, grs. 9 a day for four days in each week, was ordered. From this point there appeared an abrupt amelioration in symptoms so that after two months the child was practically well.

Case 8.—Mahomedan boy, aged 12. Five months previously the boy was attacked suddenly with fever, and swelling and pain in the wrists, elbows and knees. The patient complained of a sore throat. The attending physician diagnosed rheumatic fever. The duration of the disease was 21 days and the boy made an apparently good recovery.

The present condition is as follows:—The boy is slightly anaemic, there is a soft blowing murmur at the apex with a reduplicated second sound. The pulse when he is lying is 88, standing it is 82, and on very slight exertion 92. It is suspected that the infection is still at work.

Case 9.—Hindu female, aged 23. The patient has had three children. Generalized pain all over the body followed by pain flitting from joint to joint. The throat was painful and swallowing became difficult, but there was no sign other than redness of the fauces. There was irregular fever rising to 104°F. After five days of treatment with sodium salicylate, grs. 40 per day, the symptoms abated but recurred and persisted for a month in spite of sodium salicylate administered in doses of grs. 120 per day. During this time the patient developed a progressive anaemia and an apical murmur

of increasing intensity. Ultimately she made an apparently complete recovery save that the apical systolic murmur persists.

Case 10.—Hindu male, aged 22. Admitted to Chinsura Hospital for acute febrile arthritis of 10 days duration. The right ankle and both knees are inflamed and tender with effusion.

There is a history of multiple boils all over the body for the last two months but no pyorrhoea or tonsillitis.

Heart.—First sound, soft blowing murmur at the apex.

Under salicylate treatment the joints subsided in five days and the patient consequently refused to stay in hospital. Fifteen days later he was again admitted to hospital in the same condition as before. The relapse had started on the day following that on which he had left hospital. After three days the temperature which had not been above 100°F. fell to normal and the pulse which had shown no marked acceleration fell to 60 and subsequently rose to 64.

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ALEPOL IN THE TREATMENT OF LEPROSY

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OF the various preparations of hydnocarpus oil used in the treatment of leprosy, Alepol—a sodium salt of a selected fraction of the fatty acids of hydnocarpus oil—is one. Alepol can be given intramuscularly or subcutaneously. For the last year in our leprosy clinic I have been trying subcutaneous injections of Alepol with fairly good results. Cases are treated as out-door patients twice weekly on Wednesdays and Sundays. The following table shows the symptoms of some of the cases who are attending as out-door patients and are being given Alepol injections. I have only cited in the following table those cases who

TABLE

Serial numbers	Name and age	Caste and sex	Duration of treatment	Anaesthesia	Hyperaesthesia	Depigmentation	Erythematous patches	Thickness of nerves	Ulcers	Nodules	Number of Alepol injections (3%) given subcutaneously
1	Sukai,	H. M.	9 months	+++	++	+++	+	++	-	++	50
2	Maharani,	H. F.	6 "	+++	-	++	-	-	-	-	22
3	Sent. Pd.,	H. M.	9 "	+++	-	+++	+	++	+++	-	50
4	Bindesry Pd.,	H. M.	9 "	+++	-	+++	++	+	++	-	50
5	Raghubir,	H. M.	2 "	+++	-	++	+	+	++	++	10
6	Mahungu,	H. M.	9 "	+++	+	+++	-	-	-	+	50
7	Baij Nath,	H. M.	2 "	++	-	+++	-	-	-	-	10
8	Mahbob,	M. M.	3 "	+	-	++	-	-	-	-	18
9	Lala,	H. M.	3 "	++	-	+++	-	++	-	-	17
10	Rahimbux,	M. M.	3 "	+++	-	+++	-	++	-	-	16
11	Ganga Pd.,	H. M.	3 "	+++	-	+++	++	++	-	++	21
12	Habibila,	M. M.	3 "	++	+	++	+	-	-	-	15
13	Dhondai,	H. M.	5 "	+++	-	+++	-	+	-	-	30
14	Ori,	H. M.	2 "	++	-	+++	-	-	-	-	10
15	Ram Nath,	H. M.	4 "	++	-	+	-	-	-	-	16
16	Mahadeo,	H. M.	2 "	++	-	+++	-	-	-	-	10
17	Raghub,	H. M.	2½ "	+++	++	+++	-	-	-	-	15
18	Ganish T.,	H. M.	2½ "	++	-	-	-	-	++	-	17
19	Md. Jaffar,	M. M.	2 "	++	-	-	++	-	-	-	10
20	Chandii Pd.,	H. M.	2 "	+++	-	-	-	-	-	-	10

H. M. = Hindu Male; M. M. = Mohammedan Male; F. = Female.

were given not less than 10 injections and who attended our leprosy clinic for not less than two months. A 3 per cent. solution of Alepol was made; this was well sterilized and carbolyzed (0.5 per cent.). It was changed every fortnight. Injections were given twice weekly beginning with 1 c.cm. The dose was gradually increased by 1 c.cm. each week. The dose was not increased beyond 8 c.cm. No reaction was marked in any of the cases till the dose was 5 c.cm. and when the dose was increased beyond 5 c.cm. in some cases a slight reaction, vague pain in the joints and slight fever, was noticed, but this reaction subsided the next day. Besides giving Alepol injections, the nodules and leprotic patches were occasionally painted with trichloroacetic acid 1:3 and chaulmoogra oil was given every week for local application to the body. Other minor ailments were attended to symptomatically. Cases whose Wassermann reaction was positive were also given antisyphilitic treatment.

Cases 1 and 8 who have had about 50 injections up till now and are under treatment for the last 9 months showed marked improvement. The superficial anæsthetic patches have all cleared up and the skin has assumed a 'crushed-tissue-paper' appearance, owing to the resolution of the leprosy infiltration. Cases 3 and 4 are cousins; perforating ulcers in their feet have all cleared up though no special treatment was given for the ulcers. Deep anæsthetic patches are also clearing up and the superficial anæsthetic patches have all cleared up. Case 15 has had only 10 injections up till now. He had only one anæsthetic patch which is now much reduced in size. In case 19 the erythema of the face has much subsided and the anæsthetic patches are also better. In short the general condition of all the above cases is improving and they are looking much better; the anæsthesia, nodules, and erythema are clearing up and the general debility has much subsided.

Conclusion.—Alepol is well tolerated by patients, it is less irritating than and does not cause as much reaction as E.C.C.O. and other preparations of hydnocarpus oil, and it is comparatively cheaper.

My thanks are due to Major J. B. Vaidya, I.M.S., Civil Surgeon, Gorakhpur, for his kind permission to publish this note.

OBSERVATIONS ON A PLASMODIUM INFECTION WHICH CAUSES HÆMOGLOBINURIA IN CERTAIN SPECIES OF MONKEY

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and
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Kala-azar Enquiry, Indian Research Fund Association
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WHILE carrying out routine blood examination, on monkeys, as a preliminary measure to

certain hæmatological experiments in connection with our kala-azar research work, one of us (H. G. M. C.) encountered a protozoal parasite in a red blood corpuscle. On further investigation we found that in the peripheral blood of this monkey, subsequently identified as *Cercopithecus pygerythrus*, there were a number of different forms of a plasmodium which had many of the characters of *Plasmodium kochi*. (We have made no further study of the parasite from the protozoal aspect as this is being done by other workers in the School.) The monkey did not seem to be in any way affected by this infection which was never intense and which was not always patent, even when a careful and prolonged examination of the blood was made.

About two cubic centimetres of the blood of this monkey was taken from a vein added to an equal quantity of citrate saline and inoculated intravenously into three monkeys, two *Cercopithecus pygerythrus* and one *Macacus rhesus*: the former two became infected on the 14th and 15th days, respectively, taking a mild infection, and in the other, the *rhesus* monkey, parasites were first found on the 9th day; by the 12th day he was found to be suffering from a most intense infection, with at least 60 per cent. of the red cells infected, and to this he rapidly succumbed.

Just before his death blood was taken—less than one cubic centimetre; this was diluted with citrate saline and injected subcutaneously into four more *M. rhesus* monkeys.

Subsequently, the plasmodial infection was passaged through a series of monkeys of both these species in order to study the cytological changes which occurred in the blood during the development and resolution of this infection, in connection with our kala-azar investigations. No special plan was followed in passing this strain; some monkeys were given small doses of quinine to prevent the infection killing them, others were left untreated. Our primary consideration was to avoid losing the strain and such monkeys as were available for passage were used.

We found that by giving the monkeys one grain of quinine sulphate a day by the mouth for about a week, and then a single dose of one or two grains now and then, the infection was kept in check.

The animals did not exhibit any regular pyrexia. Occasionally their temperature rose to 105°F. from their normal which is between 102°F. and 103°F., but the fever bore no relationship to the parasite count; the only characteristic feature was the rapid drop to well below normal when the infection rose to above a million parasites per cubic millimetre.

About the same time blood was taken from the original monkey by Dr. B. M. Das Gupta who wished to study the parasite from the protozoological aspect, and the infection was

passed through a second series of monkeys of a number of different species and, as a therapeutic measure, to three human patients.

Amongst the monkeys of the first series (inoculated in the kala-azar laboratory) a number were found to be suffering from hæmoglobinuria; this complication was not at first noted amongst the monkeys of Dr. Das Gupta's series, but at a later date some of these also developed hæmoglobinuria.

It was noticed that hæmoglobinuria occurred only in *M. rhesus*, but it was not clear why some did and others did not develop this complication. By way of investigating this point we decided to trace the course of the plasmodial strain in the various monkeys through which we had passaged it. We made tables summarizing the experiments and drew a 'genealogical tree' showing the source of the morbid material with which each monkey had been infected, the length of the incubation period, and the fate of the infected monkeys. A few facts can be noted from the chart and the tables.

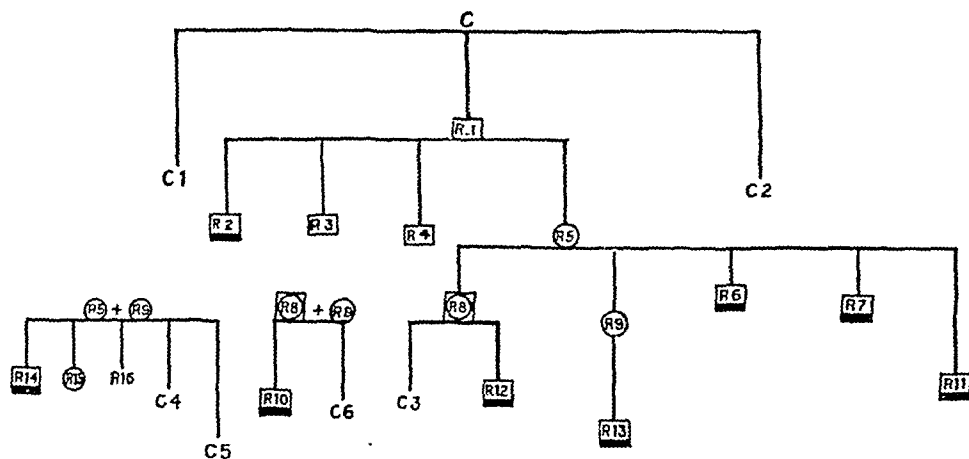
was not noted; it was noted in only one of the three untreated monkeys of the second passage; but in the third and fourth passages 7 out of 8 *M. rhesus* monkeys died with hæmoglobinuria.

(d) The incubation periods in days are shown in the table below:—

	Days before appearance of parasites in peripheral blood	Mean number of days
1st passage ..	9	9
2nd passages ..	8, 8, 9, 9	8.5
3rd " ..	4, 5, 5, 7, 13	6.8
4th " ..	5, 5, 5, 6, 7, 9	6.3

There would, therefore, appear to be a tendency towards diminution in the incubation period in the later passages. The same diminution in the survival period in the untreated monkeys will be observed; in the first two passages the mean was 12.25 days, and in the latter passages 9.6 days, if the monkey which showed some 'resistance' to infection and survived be excluded.

CHART



C = Original naturally-infected *Cercopithecus pygerythrus*.

C1 to C6 = *Cercopithecus pygerythrus*.

R1 to R16 = *Macacus rhesus*.

○ indicates treated. □ indicates died.

◻ indicates died with hæmoglobinuria. ○ indicates died despite treatment.

The lengths of the vertical lines are proportionate to the incubation period.

(a) In *Cercopithecus pygerythrus* the infection runs a mild course; excluding the monkey in which the original strain was found, six were infected and none of these acquired a fatal infection although no treatment was given; in this species the mean incubation period was 10.5 days.

(b) In *Macacus rhesus* the infection runs a virulent course; out of 16 inoculated, 4 were given quinine and of these 3 survived; 12 were not treated, and of these 11 died.

(c) Hæmoglobinuria was noted in 8 of the 11 *M. rhesus* monkeys that died. In the *M. rhesus* of the first passage, hæmoglobinuria

There can be no question about the conclusion regarding the susceptibility of the two species but the other two observations require some comment.

There was no association between the occurrence of hæmoglobinuria and the giving of quinine; it appeared before quinine was given and in no instance in which there was not already evidence of hæmoglobinuria did it appear after quinine was given. In some instances the hæmoglobinuria was apparently associated with suppression of urine, as in these cases no urine was passed and on post-mortem examination only a small quantity of dark re-

TABLE I
Macacus rhesus

Serial number of monkey	SOURCE OF INOCULATED BLOOD			INFECTION		DEATH		REMARKS
	Approximate number of parasites per c.mm. in inoculated blood	From monkey number	Date when given	Date of first positive finding	Incubation period in days	Date	Days from first inoculation	
R 1	Scanty	C	23-7-31	1-8-31	9	4-8-31	12	Hæmoglobinuria.
R 2	2,000,000	R 1	4-8-31	12-8-31	8	15-8-31	11	
R 3	2,000,000	R 1	4-8-31	12-8-31	8	18-8-31	14	
R 4	2,000,000	R 1	4-8-31	13-8-31	9	16-8-31	12	
R 5	2,000,000	R 1	4-8-31	13-8-31	9	Alive	..	
R 6	1,200	R 5	15-9-31	19-9-31	4	24-9-31	9	Hæmoglobinuria.
R 7	1,200	R 5	15-9-31	20-9-31	5	21-9-31	6	
R 8	2,000	R 5	21-9-31	26-9-31	5	12-11-31	..	
R 9	2,000	R 5	21-9-31	28-9-31	7	Alive	..	Quinine gr. i from 28-9-31.
R 10	Scanty + 300	R 8 + R 9	19-10-31	26-10-31	7	28-10-31	9	
R 11	400	R 5	8-11-31	21-11-31	13	23-11-31	15	Hæmoglobinuria.
R 12	300	R 8	8-11-31	14-11-31	6	19-11-31	11	Hæmoglobinuria.
R 13	1,200	R 9	8-11-31	17-11-31	9	18-11-31	10	Hæmoglobinuria.
R 14	300 + 600	R 9 + R 5	20-11-31	25-11-31	5	27-11-31	7	Hæmoglobinuria.
R 15	300 + 600	R 9 + R 5	20-11-31	25-11-31	5	Alive	..	Hæmoglobinuria.
R 16	300 + 600	R 9 + R 5	20-11-31	25-11-31	5	Alive	..	Quinine grs. ii from 28-11-31.

TABLE II
Cercopithecus pygerythrus

Serial number of monkey	SOURCE OF INOCULATED BLOOD			INFECTION		REMARKS
	Approximate number of parasites per c.mm. in blood inoculated.	From monkey number	Date when given	Date of first positive finding	Incubation period in days	
C	Naturally infected.					
C 1	Scanty	C	23-7-31	7-8-31	15	All three died, obviously of some intercurrent infection, a few weeks later.
C 2	Scanty	C	23-7-31	6-8-31	14	
C 3	400	R 8	28-10-31	4-11-31	7	
C 4	Scanty + 30	R 5 + R 9	19-10-31	26-10-31	7	Alive.
C 5	500 + 300	R 5 + R 9	13-11-31	25-11-31	12	
C 6	400 + 300	R 8 + R 9	28-10-31	5-11-31	8	

urine was found in the bladder; in others the monkey passed red urine, and after death a distended bladder full of hæmoglobinized urine was found.

When passed the urine was bright red, later turning to a dark brown colour. Urine recovered from the bladder of a monkey that had died over-night was almost completely black. Chemically it gave the usual hæmoglobin reactions and the presence of hæmoglobin was confirmed spectroscopically. No unhæmolyzed red blood cells were observed in the specimen.

The hæmoglobinuria was always associated with very heavy parasite counts in the peripheral blood.

In the second series of monkey passages carried out by Dr. B. M. Das Gupta hæmoglobinuria was not noted; this could probably be accounted for by the fact that at first he passaged mostly from *Cercopithecus* monkeys. In his series the only monkeys that showed hæmoglobinuria were a few *M. rhesus* after passage of the virus through other *M. rhesus* monkeys.

A suggestion that has been made regarding the variations in incubation time is that they may have varied with the dose of the virus. This was, however, obviously not the only factor; in the first passages a much larger quantity of blood was used than in the later

passages after we had found that a large quantity was unnecessary; as little as 0.1 cubic centimetre was found to be sufficient. In these cases the incubation period bore no relationship to the dose of virus administered.

A reasonable hypothesis is that the virulence of the infection, as evidenced by a shorter incubation period and hæmoglobinuria, was raised by passage through a series of monkeys of a more susceptible species.

Discussion

The presumption is that in nature the plasmodium passes from monkey to monkey of the species in which we first found it, with some mosquito as intermediate host and transmitter, and that in this monkey, which has either a natural or an acquired immunity, the infection runs a benign course but is maintained as a low-grade infection. If by any chance the infection were transmitted to a *rhesus* monkey, the latter would probably die prior to the development of any significant number of gametocytes and that particular strain of plasmodium would die with it.

One cannot resist drawing comparison between this state of affairs and that which is observed in the case of human malaria, where the indigenous population of certain tropical tracts appear to suffer little inconvenience from their malarial attacks but where strangers suffer severe infections frequently ending in blackwater fever.

From our observations it would appear that the virulence of the strain is increased by a few rapid passages through a highly-susceptible host, and one wonders if the same thing occurs in these highly-malarious districts and accounts for the variations in the severity of the clinical manifestations in different individuals.

It is obviously not possible to be dogmatic on these few observations, but, as it would take a very large number of experiments involving the sacrifice of numerous monkeys to prove the theory which our preliminary observations suggest and as this particular strain of plasmodium has now been passaged so frequently that it may have lost its original pathogenic characteristics, we feel that we should record our observations and leave it to others, better qualified to do so, to carry on this investigation.

THE CURATIVE VALUE OF A LOCALLY-PREPARED SAMPLE OF SULPHAR-SENOBENZENE-THIOSARMINE

Part II

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THE present paper is a continuation of our previous paper with the same title.

The compound in question is now available in the market under the name of 'Thiosarmine'.

Group 1.—This series includes patients with inoculation lesions. Total number of cases—3 (cases 51 to 53).

Notes on the cases :—

- (a) Indurated chancre present in all these cases.
- (b) *Treponema pallidum* was found in the scrapings from the lesions in all cases.
- (c) At the beginning of the treatment the Wassermann reaction was negative and became positive during course of treatment.

Observations.—The chancre healed up in all cases after 3 or 4 injections. The Wassermann reaction became negative after completion of treatment in 2 cases (cases 51 and 52), and in case 53 the Wassermann reaction remained positive throughout our observations, though the chancre healed up completely and general conditions were markedly improved. This patient is still under observation and taking a second course of treatment.

Group 2.—This series includes patients with a positive Wassermann reaction with inoculation lesions or with old healed chancres with inguinal adenitis but no other outward signs or history of general infection. Total number of cases—13 (cases 54 to 66).

Notes on the cases :—

- (a) Old healed chancre with suppurating inguinal adenitis in 4 cases (cases 54 to 57) and without suppuration in case 58.
- (b) Unhealed chancre with suppurating inguinal adenitis in 8 cases (cases 59 to 66).

Observations.—Local conditions healed up quickly, the general condition was markedly improved and the Wassermann reaction became negative after the course of treatment in all cases, except one, case 66. This patient is still under observation.

Group 3.—This series includes patients with a positive Wassermann reaction with outward signs and symptoms of general infection. Total number of cases—25 (cases 67 to 91).

Notes on the cases :—

- (a) Cases with syphilitic arthritis of ankle and knee joints, rise of temperature, giddiness and general disturbances in 4 cases (cases 37 to 40).
- (b) Cases with iritis, keratitis, inguinal adenitis, low fever, general weakness, anæmia, chronic pharyngitis, in 6 cases (cases 71 to 76).
- (c) Cases with inguinal adenitis, general weakness, chronic pharyngitis, anæmia in 5 cases (cases 77 to 81).
- (d) Cases with skin eruption, inguinal adenitis, anæmia, pain all over the body in 4 cases (cases 82 to 85).

TABLE

Table showing treatment with Thiosarmine (Sulpharsenobenzene) and its effect on the Wassermann reaction in 50 cases

Group	Case numbers	Total quantity injected in grammes	Total number of injections	Duration of treatment	Periods during which Wassermann reaction was negative and remained the same	Period of observation since beginning of treatment up to end of observation
I	51	2.1	6	11 days	4 months	4½ months
	52	3.3	8	16 "	2½ "	4 "
	53	8.1	16	40 "	W. R. positive	W. R. positive
II (a)	54	3.3	8	16 days	5 months	6½ months
	55	4.5	10	22 "	4½ "	5½ "
	56	6.9	14	34 "	3 "	4 "
	58	3.9	9	19 "	3½ "	4½ "
(b)	59, 60	5.1	11	25 days	3 months	4½ months
	61, 62	3.9	9	19 "	5 "	6½ "
	63					
	64, 65	4.5	10	22 "	6 "	7 "
	66	8.1	16	40 "	W. R. positive	W. R. positive
III (a)	67, 68	8.1	16	40 days	2½ months	4½ months
	69	6.9	14	34 "	3½ "	5 "
	70	4.5	10	22 "	4 "	5½ "
(b)	71	4.5	10	22 days	4 months	6 months
	72	5.7	12	28 "	6 "	9 "
	73	3.3	8	16 "	3½ "	5 "
	74, 75	6.3	13	31 "	5½ "	6½ "
	76	6.9	14	34 "	4½ "	6 "
(c)	77	4.5	10	22 days	3 months	5½ months
	78, 79	6.3	13	31 "	4 "	5½ "
	80, 81	8.1	16	40 "	4½ "	6 "
(d)	82	5.7	12	28 days	4 months	5½ months
	83	6.9	14	34 "	5½ "	8 "
	84	3.9	9	19 "	6 "	9½ "
	85	4.5	10	22 "	4 "	9 "
(e)	86	5.7	12	28 days	3 months	5 months
	87, 88	6.9	14	34 "	4 "	3½ "
	89	8.1	16	40 "	W. R. positive	W. R. positive
	90, 91	4.5	10	22 "	3½ months	6 months
IV	92	8.1	16	40 days	4 months	6½ months
	93, 94	5.7	12	28 "	3½ "	5 "
	95	3.3	8	16 "	4½ "	6 "
	96, 97	4.5	10	22 "	4 "	5½ "
	98	8.1	16	40 "	W. R. positive	W. R. positive
	99, 100	6.9	14	34 "	4½ months	7 months

(e) Cases with skin eruptions, low fever, general weakness, anæmia, constant headache, etc., in 6 cases (cases 86 to 91).

Observations.—Swelling and pain of the joints in all arthritic cases were markedly diminished quickly after treatment. The suppurating adenitis healed up quickly after

removal of the glands. The Wassermann reaction became negative after completion of treatment in all cases, except case 89 which was positive throughout the observations and in which secondary manifestations on the skin did not disappear completely. This patient is still under observation and has been directed to take a second course of treatment.

Group 4.—This series includes patients with the following conditions:

- (a) Wassermann reaction strongly positive.
- (b) History of local and outward manifestations present.
- (c) General symptoms such as anæmia, pain all over the body, giddiness, frequent supraorbital headache, general weakness, gastric and intestinal disturbances, slow rise of temperature, etc., were markedly present at the commencement of treatment.

Total number of cases—9 (cases 92 to 100).

Observations.—General symptoms disappeared quickly after a few injections. The general health was markedly improved, the Wassermann reaction became negative in all cases except one, which remained positive throughout. This patient is still under observation and waiting for the second course of treatment.

Remarks

A second series of 50 cases of syphilis in various stages of the disease are described in the present paper in which the specific effect of Thiosarmin is manifested in a remarkable way.

We are indebted to the 'Brahmachari Research Institute' for the free supply of Thiosarmin for treatment of above cases in the Police Hospital, Calcutta.

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CYTOLOGICAL STUDIES OF THE BLOOD AND TISSUES IN KALA-AZAR AND ASSOCIATED CONDITIONS

Part I*

SUPRA-VITAL STAINING TECHNIQUE

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Introduction

WHATEVER the means by which kala-azar is transmitted from one person to another, it is obvious that healthy man possesses a considerable degree of resistance to infection. We have epidemiological and clinical evidence to show that kala-azar in man is, in a large percentage of cases, preceded by a malaria or a typhoid attack and that during this attack there is

in the body defences a specific lowering which allows a generalized invasion of leishmania to take place.

It is known that considerable cellular changes occur during the process of invasion by a protozoal parasite and that, though the whole defensive process is probably not cellular in nature, the cellular changes are characteristic and probably reflect parallel humoral changes which together constitute the general immunity response. In all infective processes, but especially in those caused by protozoal parasites, the cells of the large mononuclear group are those most frequently associated with immunity response; this group of cells is not, however, homogeneous either as regards the function or the origin of the constituent cells, but neither by their morphological appearance nor their reaction to the ordinary dyes can they be distinguished from one another with any degree of certainty. However, by means of the more-recently-introduced vital staining methods they can be differentiated into their various functional groups.

In furtherance of our investigations into the mechanism of infection and immunity in kala-azar we decided to study, with the help of supra-vital staining technique, the cytology of the blood and certain tissues, firstly, in those conditions in which a person is known to be susceptible to kala-azar in order to see the cellular picture associated with predisposition to generalized leishmania infection and therefrom possibly deduce the actual mechanism of infection, and, secondly, in the kala-azar patient during the devolution of the infection in order to see the cellular changes that occur when the infection is being controlled and overcome.

Before proceeding to report the results of these studies it was felt that the technique should first be described, not so much to present any new facts about the staining method, but rather to record our experiences with it, to point out some of its difficulties, and to describe how best to overcome them. For the working out of the details of the technique, and for any modifications and improvements that have been introduced, the two junior writers are entirely responsible, but we should like to take this opportunity of thanking our former colleague, Dr. J. M. Henderson, for some valuable practical suggestions.

Historical

The credit for the development of the modern technique of supra-vital staining goes not to one but to several persons. As early as 1900, Pappenheim (1906) successfully attempted to stain cells in their living condition by the use of brilliant cresyl-blue and a combination of neutral red and Janus green. He spread on the surface of a slide an alcoholic solution of the dye and allowed it to dry; he then obtained a fresh drop of material containing living cells

*Parts II and III of this series appeared in the March number of this *Gazette*.

on a cover glass and applied it to the prepared slide; on examining this preparation he noticed that some of the living cells had taken up the stain in a characteristic manner. Next Ribbert in 1904, using a colloidal solution of lithium carmine, noticed that after intravenous injections of the material into animals the whole body did not stain, but only certain cells picked up the dye selectively and that these cells were the same as those that picked up hæmosiderin and fat. Then Bouffard (1906) while searching for specific chemicals for use in the treatment of bacterial and protozoal diseases, found that when certain benzidine dyes, such as isamin-blue, were administered intravenously, some of the large cells of the connective tissues were specifically stained. Later these techniques, modified to varying extents, were used by Rosin and Bibergeil (1902-1904) in the study of the lymphocytes, by Maximow (1906), Goldmann (1909), Tschaschin (1913), Aschoff and Kiyono (1913), and Evans and Schulemann (1914) in the study of histiocytes, and by Cowdry (1914) in the study of human blood cells. Thus while Pappenheim and Ribbert were the first to introduce the method of vital staining for the study of living cells in general, Cowdry was perhaps the first to apply the technique to the differentiation of human blood cells. Coming to more recent times we find that the technique is now applied more widely than is commonly recognized, being increasingly utilized in research work connected with all branches of cytology. Thus, Simpson (1921-22), Sabin (1923), and Sabin, Doan and Cunningham (1925) have all used the method for various purposes, and shown how wide its application and possibilities may be. In India Mulligan (1929) used the supra-vital technique for the study of the mononuclear cells in malaria.

Terminology

Three terms commonly used in connection with the staining of living cells that need a word of explanation are 'intra-vital', 'supra-vital' and 'vital'.

The term 'intra-vital staining' is used when living cells are stained *inside* the living animal by injection of solutions of vital dyes such as pyrrol-blue, trypan-blue, isamin-blue, toluidin-blue or lithium carmine. By this method it is found that certain cells of the animal will stain electively leaving others unstained. For example the mesenchymal type of cell takes up the dye in a special way and from the nature and distribution of the dye granules in its cytoplasm it is possible to differentiate this type from others belonging to the lymphatic or myeloid series. Unfortunately this method is of very limited application and is not of much help in the study of human cells.

The term 'supra-vital' staining is used when surviving cells are stained *outside* the animal

body. For this, material containing living cells is obtained from the living animal on a cover-glass, is inverted on specially-prepared slide which has a very thin film of vital dye (such as pyronin, methyl-green, cresyl-blue, methylene azur or a mixture of neutral red and Janus green) evenly spread on its surface, and is examined on a warm stage. By this method the various cell types are found to be stained differently, as in intra-vital staining, and can be identified and classified with a good deal of certainty. For the study of human cells this method is of greater use and of wider application than the first.

The term 'vital staining' is used by some in a restricted sense meaning intra-vital staining and by others in a general sense to include all methods of staining living cells. We prefer to use the term in the latter sense.

Technique

Of the two methods of staining living cells referred to above, the supra-vital staining method is undoubtedly the method of choice for the study of human cells and therefore it was used by us in our cytological investigations. A detailed description of it is given here. Although in the main our technique is the same as that of Sabin and her co-workers, it includes a few modifications and suggestions which proved in our hands invaluable.

Cleaning of slides and cover glasses

(1) Slides are kept in glass jars containing concentrated sulphuric acid to which a few crystals of potassium bichromate have been added for a period of 4 days.

(2) The acid is drained off and the glass jar containing the slides is placed in running water from a tap for not less than 4 hours, care being taken to see that water gets between slides and all acid is thoroughly removed.

(3) By means of a pair of clean forceps, which is kept separately for this purpose, each slide is picked out singly and transferred to a new jar containing distilled water. The distilled water is changed at least four times at intervals of an hour each.

(4) The slides are again picked up with forceps and transferred to another jar containing alcohol and in these they are stored till required.

(5) Cover glasses are prepared in the same way as slides; they may also be got ready beforehand and stored in alcohol. It is satisfactory to use cover glasses 2 inches by 7/8 inch in size.

Polishing of slides

This is very essential and should never be omitted, for it not only ensures an even film of the dye on the slide, but also the motility and longer life of the cells to be studied. For polishing, the stored slide is picked up with forceps, flamed and placed on a clean sheet of

paper. The top surface of the slide is then rubbed with jeweller's rouge and a polishing cloth for at least 2 to 3 minutes, and then finally wiped with a clean piece of selyt cloth. The bare finger should never be allowed to come in direct contact with the surface of the slide. It is best to keep a separate pair of forceps for the picking up of polished slides.

Filming slides with dye

This really is the most delicate part of the technique and in order to get uniform films of the required thickness, considerable care and a certain amount of experience will be required.

(1) First of all saturated solutions of neutral red (Grubler's, specially made for intra-vital injection) and Janus green (Grubler B.) in absolute alcohol are made and kept as stock solutions preferably in drop bottles.

(2) For use 120 drops of the neutral-red solution and 30 drops of the Janus-green solution are added to 30 c.c.m. of absolute alcohol in a small cylindrical staining jar ($3\frac{1}{2}$ inches by 1 inch) with a glass stopper, or in a specimen tube of a similar size with a cork stopper. It is best not to use this diluted mixture of dyes for more than a week or ten days as the staining quality of it deteriorates rapidly. We found that preparing the week's requirement of slides (50 to 100) on the day that the mixture was made was both practical and economical.

(3) The polished surface of the slide is warmed by rapidly passing it over a flame and is then dropped into the dilute stain in the jar. It is then picked up with forceps and transferred to a similar jar or tube containing a piece of clean filter paper at the bottom, and the excess of stain allowed to drain off by standing the slide vertically. During this period the tube is kept closed to prevent atmospheric moisture getting deposited on the slide and causing unevenness or blotches in the film.

(4) As soon as most of the stain is drained off (in about half an hour) and when the film on the slide looks more or less even and dry the slide is transferred to a desiccator, and the film allowed to dry up thoroughly.

(5) When ready, the slide is removed, the dye on its unpolished surface is wiped away with a clean handkerchief, and the slide stored in a dust-proof slide-box ready for use.

It will be recognized that the thickness of the dye film must vary with the nature of the material to be examined and the number of cells to be stained. For ordinary blood work it is best to have a very faint film of dye hardly visible to the naked eye. Slight excess of stain, though helpful at times in bringing out certain cell characteristics in a shorter time, invariably injures the majority of the cells and results in the loss of motility and the rounding up of the cells; this prevents the observation of cells in a living state for any length of time. For material obtained from spleen puncture or from leukæmias, on the other hand, on account of

the large number of cells to be stained, a slightly thicker film just visible to the naked eye gives better results. The preparation of slides with films of varying thickness of dye suitable for these purposes is not a difficult matter. Instead of allowing the excess of stain to drain off for 30 minutes it is transferred to the desiccator earlier and the film thus dried a little more rapidly.

Making of supra-vital preparations

The material to be examined, whether it be a drop of peripheral blood from the finger tip, or spleen or liver puncture material, is taken on a clean dry cover glass and inverted on the polished stain-covered surface of the prepared slide. The blood spreads out into a thin even film provided the slide has been properly made. Pressure other than that caused by the weight of the cover glass is seldom necessary and is undesirable as it is likely to distort, damage or kill the cells according to its degree. The cover glass is then surrounded with paraffin of melting point about $40^{\circ}\text{C}.$, care being taken not to use the paraffin too hot, as the heat will kill the cells. After this, the specimen is best examined at the end of 5 to 10 minutes.

Examination of supra-vital preparations

In order to keep the cells alive and active during the period of examination, a warm stage, a warm microscopic box and incubation of the prepared slide for varying periods (generally 10 minutes) have all been recommended. While these methods are certainly *necessary* in cold countries they are only *helpful* in the tropics. We have tried all these appliances and feel that in the plains in India, as for example in Calcutta, where for the greater part of the year the room temperature varies between $30^{\circ}\text{C}.$ and $34^{\circ}\text{C}.$ the warm stage is not indispensable. On cold days, however, it is absolutely necessary. During the hot weather we have not used a warm stage, but on some days in the rainy season and the cold weather when the room temperature was between $26^{\circ}\text{C}.$ and $29^{\circ}\text{C}.$ we kept an electric lamp burning near the stage and this was all that was needed to give us good results.

Discussion

When we began our preliminary studies on human blood most of the polynuclear neutrophilic leucocytes in our preparations became rounded up very quickly, within about quarter of an hour. But soon we found that this was due to errors in technique, such as excess of dye, improper polishing of slides, damage to cells by pressure, heat, etc., and when these were corrected a large number of these cells were found to be alive even at the end of an hour. On several occasions we have made the supra-vital preparations in the wards and brought them up to the laboratory for examination with entirely satisfactory results. Two

useful criteria for judging whether a preparation is good or bad are motility of polynuclear neutrophilic leucocytes and coloration of cell nuclei. In a good specimen the majority of the polynuclear neutrophils should be actively motile and the cell nuclei should show no colour whatsoever except perhaps a faint tinge of green. With all our preparations we had not only sufficient time to identify each cell definitely while alive but also to obtain a differential count of the several types present and to make *camera lucida* drawings of some of them.

We can only add that strict attention to details of technique will save a lot of trouble and disappointment. It is best to remember that although the supra-vital staining technique seems quite simple at first sight, it is very delicate and requires a good deal of experience to insure reliability and uniformity in results.

The mode of action of vital dyes

At first it was thought that the vital dye, on account of its ability to permeate living cell membrane, entered the cell and stained pre-formed intracellular bodies which then became visible and helped to differentiate the cell. But now from the work of Evans, Schulemann, Shipley and others, it is clear that the staining of the large mononuclear cells with the vital dye is a process similar to phagocytosis; i.e., the dye particles are taken up by the living cell in the same way as particles of colloidal metals, Indian ink, bacteria and others, and on reaching the cytoplasm of the cell, they are segregated into masses in certain places in a characteristic manner. Vital staining is dependent upon two factors, one, the specific nature of the dye selected for use and, two, the capacity of the cell to react to the entry of this dye. As there is a very wide difference in the ability of different living cells to take up different dyes, the choice of the dye is an important matter, and will depend upon the type of cell one wishes to study. It is generally found that a combination of Janus green and neutral red is the best for the study of the leucocytes in general and of the large mononuclear cells in particular, and cresyl-blue for the study of immature red blood corpuscles, i.e., reticulocytes. With regard to the second factor it is recognized that the capacity of the cell to react to the entry of the dye will depend upon, firstly, the nature of the cell and, secondly, its vital condition. Although phagocytosis is a general property of all cells, certain cells, such as the monocytes and histiocytes, have this property accentuated for a physiological purpose and therefore one finds them taking up more dye than any other cell. Furthermore, if the vitality of a cell is lowered then its reaction to the entry of the dye will be less pronounced and the result will be a diffuse distribution of the dye and an absence of the characteristic arrangement of the dye particles within the cytoplasm

of the cell. On the other hand if the cell is in a state of stimulation then it will take up a larger amount of the dye than usual and its normal powers of segregation of the dye will also become exaggerated. From this discussion it will be evident why for obtaining good preparations it is essential that one should choose an appropriate stain and subject the cells to a minimum of injury.

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- (Other references will be found in the parts of this series of articles already published).

OBSERVATIONS ON MALARIA IN PURI DISTRICT, ORISSA

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IN connection with a programme of field studies on malaria, a small field observation station was started at Khurda Road (Puri district, Orissa). Along with other lines of work carried out at this field station, a malaria survey was carried out of several villages in Puri district as also of some villages near Chilka Lake.

In the coastal tracts of the Puri district, the soil is alluvial and in other parts it is mostly laterite and sandy soil. This part of the Orissa country is not subject to extreme variations in temperature and the mean normal variation in summer temperature is between 90°F. to 75°F. and in winter 78°F. to 65°F. The average rainfall is about 65 inches. Table I gives the average monthly rainfall and relative humidity

figures for the years 1929 to 1931 and chart I represents the same graphically:—

TABLE I*

Month	Average rainfall in inches	Average relative humidity per cent.
January	0.2	64.5
February	1.14	77.8
March	0.16	86.9
April	1.30	71.1
May	1.69	77.8
June	5.52	76.6
July	13.4	86.9
August	17.12	87.5
September	12.25	87.7
October	5.51	87.9
November	3.63	80.4
December	0.15	69.0

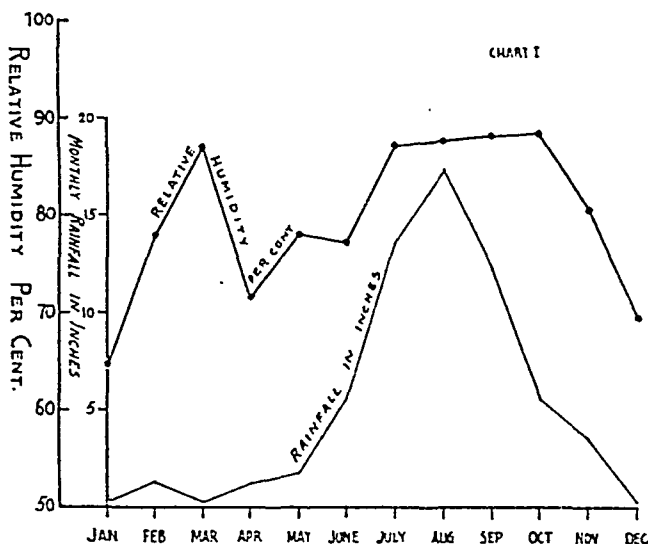


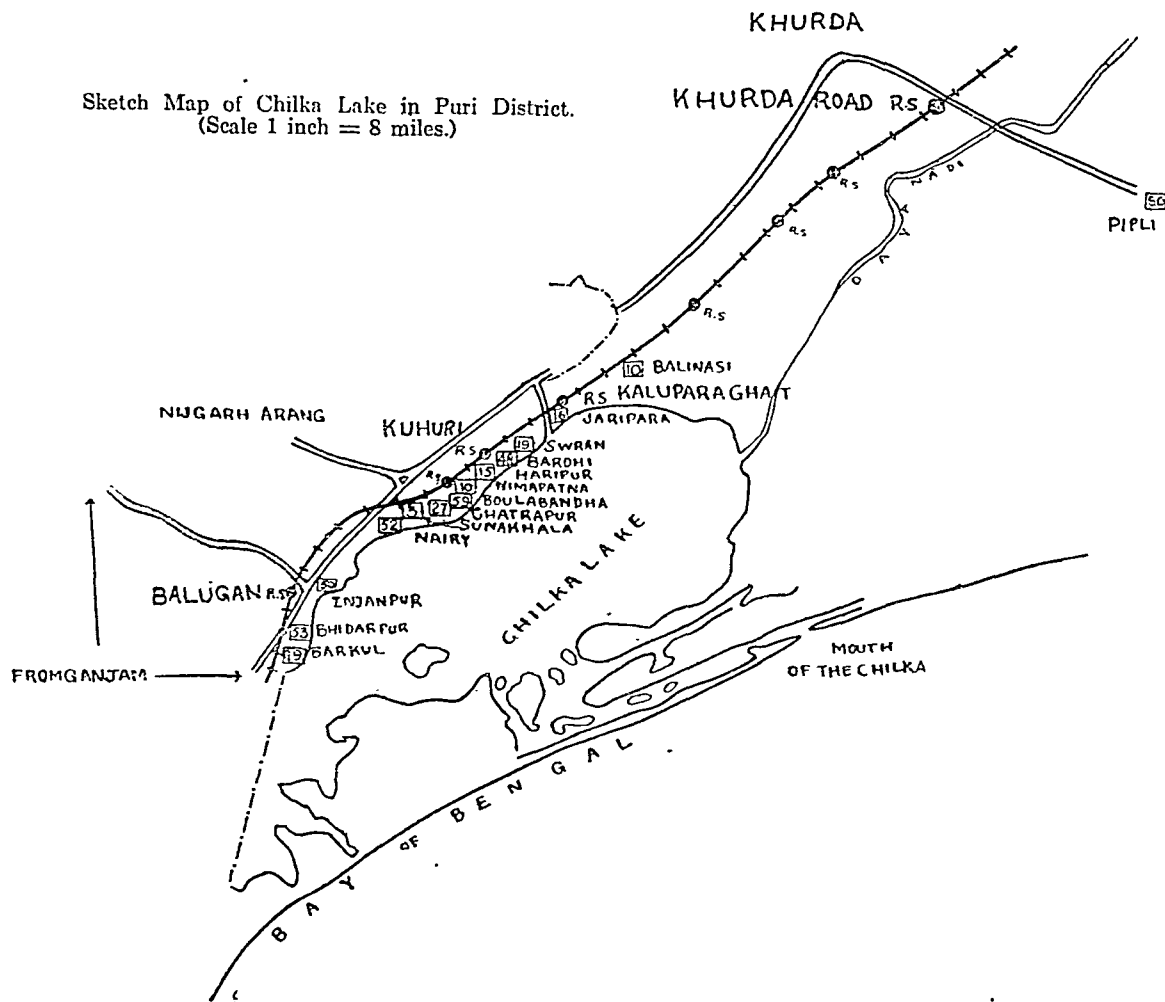
Chart I showing the average monthly rainfall in inches and the relative humidity per cent. for the years 1929 to 1931.

*The author wishes to express his grateful thanks to Mr. R. Senior-White, Malariologist, Bengal-Nagpur Railway, and also to the Subdivisional Officer, Khurda, for having permitted him to take the relative humidity and rainfall figures from their records.

Col. Fry in his reports on malaria in Bengal (Fry, 1912 and 1914) discussed the incidence

MAP 1

Sketch Map of Chilka Lake in Puri District.
(Scale 1 inch = 8 miles.)



of malaria in these places. He observed that 'Puri district showed a remarkably small fever death-rate. * * * The interior of the district is montane and submontane with a porous sandy soil and appears to be malaria free, but on the shores of the Chilka Lake, the large inland sea of Orissa, there is an intense degree of malarial infection'. Besides Col. Fry's work, very little information is available on the incidence of malaria in these tracts.

The present paper records the results of malaria surveys carried out in several villages round Khurda Road (Puri district) and Bhadrak (Cuttack district) and also of some villages on the borders of the Chilka Lake. In connection with this work, the following observations were made: examination of children for enlarged spleen, examination of blood films

on the border of the Lake, has a spleen rate of 79.3 per cent., while Sunakhala, which is some distance away, has a spleen rate of only 2.8 per cent. The incidence of splenic enlargement actually falls as one proceeds from the shores of Chilka Lake into the interior. Table II gives the results of spleen census.

Table III gives the results of spleen census of some Chilka Lake villages, carried out by Colonel Fry 20 years ago. Since Fry's report is rather difficult to get, his figures also have been included.

To study the relative incidence of the three species of malaria parasites, blood films (thin films) were taken from children with enlarged spleen and examined for malaria parasites. Out of a total of 167 films examined, 76 were found to be positive in thin film examination,

TABLE II
Spleen census of Chilka Lake villages

Name of village	F ₁	F ₂	F ₃	F ₄	B. U.	Total	Total number of children examined	Spleen rate per cent.
Jaripara ..	6	3	2	..	..	11	67	16.4
Balinasi ..	2	..	2	..	..	4	41	9.8
Bhidarpur ..	20	6	1	..	..	27	51	53.0
Injanpur ..	23	11	8	4	1	47	94	50.0
Barkul ..	17	19	7	6	1	50	63	79.3
Swaran ..	10	8	7	1	..	26	136	19.1
Hatabardbi ..	42	16	7	5	1	71	148	48.0
Itchapur ..	9	6	..	..	..	15	34	44.1
Nairi ..	48	31	19	5	4	107	207	51.7
Chatrapur ..	2	1	..	..	..	3	11	27.3
Borlabandha ..	35	24	20	5	2	86	145	59.3
Sunakhala ..	..	..	1	..	..	1	35	2.8
Nimapatna ..	2	1	..	..	..	3	30	10.0
Haripur ..	6	4	1	..	..	11	73	15.0

Total number of children examined .. 1,135
Total number with enlarged spleen .. 462
Gross spleen rate .. 40.7 %

for malaria parasites, a survey of the *Anopheles* breeding places and the incidence of adult mosquitoes, and, lastly, dissection of mosquitoes caught from houses. In connection with the examination of children for enlarged spleen, 1,135 children were examined.

The area surveyed is shown on map I and the results of the spleen census marked on it. It will be observed that spleen rates are generally very high on the borders of Chilka Lake, while those farther away from it have a comparatively lower spleen rate. Barkul, situated

working out to a parasite rate of 45.5 per cent.

Taking the positives as 100, the relative incidence of the three species is as given below in table V.

A detailed statement of the villages from which these films were obtained is given in appendix I.

Anopheline fauna

At Khurda Road vigorous anti-malarial operations such as Paris-greening and oiling are going on and for this reason very few larvæ were

TABLE III
Table of spleen rates, Lake-side villages

Name of village	Number of children examined	No. 1 *	No. 2	No. 3	No. 4	No. 5	Spleen rate per cent.
Satpara ..	87	7	21	22	22	15	..
Gurugai ..	41	1	12	16	4	8	..
Naogon ..	10	..	4	5	1	..	..
Alupatna ..	24	3	4	11	6	..	..
Tuha ..	19	4	2	9	2	2	..
Mansa ..	24	10	4	5	4	1	..
TOTAL ..	205	25	47	68	39	26	87

* Figures under this heading represent the negatives.

TABLE III—contd
Villages partly on Lake, partly inland

Name of village	Number of children examined	No. 1	No. 2	No. 3	No. 4	No. 5	Spleen rate per cent.
Balugaon	69	24	20	11	3	1	..
Chandrapat	40	30	6	3	1
TOTAL	109	54	26	14	4	1	50

Villages inland

Bhanpur	74	72	2	2.7 *
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* From the above figures it will be seen that the gross of spleen rate as found by Fry 20 years ago works out to 39.0 per cent. while the present gross spleen rate is 40.7 per cent. and there has not been any change in the gross spleen index of the area during the last 20 years.

Endemic index

Name of village	Number of films	Negative	B. T.	M. T.	Q.	Endemic index
Satpara	37	21	6	3	7	..
Gurugai	12	5	4	2	1	..
Tuha	11	7	2	2	..	..
Mansa	22	14	5	2	..	..
Balugaon	17	15	..	2	..	..
Burkool	27	16	4	1	6	..
TOTAL	126	78	21	12	14	37.4

TABLE IV

Total number examined	Total positive	Percentage	<i>P. vivax</i>	<i>P. falciparum</i>	<i>P. malariae</i>
167	76	45.5	36	28	12

TABLE V

<i>P. vivax</i>	<i>P. falciparum</i>	<i>P. malariae</i>
47	37	16

caught in the area, principally from railway borrow-pits and paddy fields. But one or two miles away from the control area, a large number of mosquitoes could be caught in the villages. The area is rich in Anopheline fauna and as many as 15 species were observed here during the period of study. The following is a list of the species of Anopheles observed in the area :—

A. hyrcanus var. *nigerrimus* Giles; *A. barbirostris* Wulp; *A. subpictus* Grassi; *A. vagus* Donitz; *A. fuliginosus* Giles; *A. pallidus* Theobald; *A. philippinensis* Ludlow; *A. maculipalpis* var. *indensis* Theobald; *A. karwari* James; *A. culicifacies* Giles; *A. aconitus* Donitz; *A. varuna* Iyengar; *A. tessellatus* Theobald; *A. jamesi* Theobald; and *A. ramsayi* Covell.

The principal breeding places are paddy fields, depressions and ditches holding up rain water. After the close of the rainy season

there occurs a marked fall in the density of the mosquito population. This is largely due to the drying up of stagnant pools and ditches and of the paddy fields. There is no true hibernation or 'wintering' of mosquitoes here, as the minimum cold-weather temperature does not generally go below 65°F.

The breeding places of the Anophelines here fall into three distinct groups, namely,

- (i) Paddy fields breeding *fuliginosus*, *pallidus*, *sinensis*, *barbirostris*, *culicifacies*, *tessellatus*, *subpictus*, and *vagus*;
- (ii) Seepages breeding *maculipalpis*, *karwari* and *jamesi*, and
- (iii) Stagnant pools and ditches breeding *subpictus*, *vagus*, *sinensis* and *barbirostris*.

The breeding in paddy fields is extensive; the seepages are few and small and with very scanty breeding. Two small ponds were observed to breed *aconitus* and *varuna* after September.

A. ramsayi: This species was not observed in Khurda Road, although it was found breeding profusely in villages ten miles away from Khurda Road.

A. fuliginosus is the predominant species in this area. Table VI gives the incidence of *A. fuliginosus* during the months August to December 1931 :—

TABLE VI

Month	Adult incidence of <i>A. fuliginosus</i> , per cent.	Malaria cases treated at Khurda Road. Ratio to total cases per cent.	Monthly rainfall in inches
August ..	88.5	0.07	24.11
September	89.4	0.11	12.47
October ..	91.2	0.85	6.83
November	66.8	1.53	1.78
December	24.0	0.29	0.3

Chart II represents the results graphically and shows an interesting correlation between the percentage of malaria cases treated at Khurda Road and the prevalence of *A. fuliginosus*. The relation of this species to malaria transmission in this area is discussed in a later part of this paper.

A. subpictus and *A. vagus*: These were observed in large numbers till October. Their numbers diminished remarkably with the onset of winter, and during the subsequent months very few specimens of these species were available even during prolonged search.

A. sinensis: This commences to breed in large numbers from the month of November and was fairly common throughout the winter. It was observed to breed in paddy fields, small roadside collections of water and also in ponds in association with *A. aconitus* and *A. varuna*.

A. philippinensis: During the period two adult specimens were caught in houses; the exact breeding place of the species has not been located.

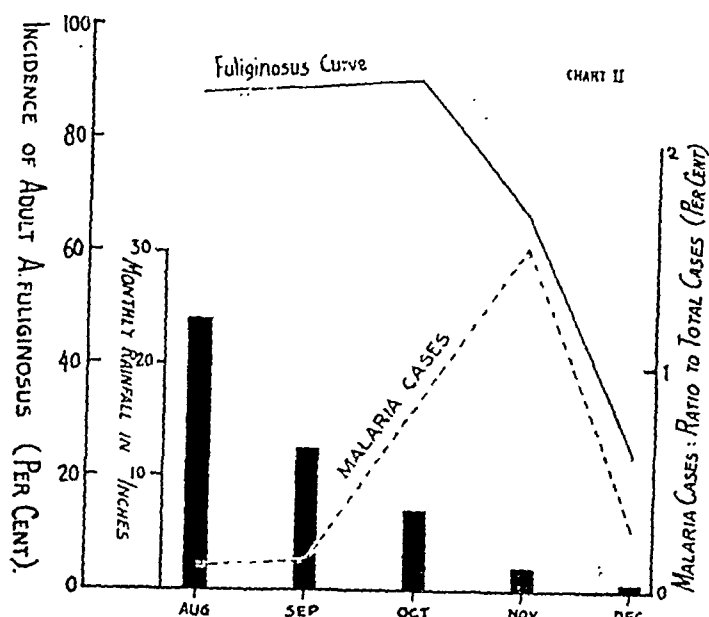


Chart II shows the percentage incidence of adult *A. fuliginosus*, the percentage of malaria cases treated and the monthly rainfall from August to December 1931 at Khurda Road.

From the manner in which the spleen rate diminishes rapidly as one proceeds from the shores of Chilka Lake into the interior, it would have been reasonable to suspect that the Lake was responsible for the output of carrier mosquitoes. As the Lake is a brackish-water lake, the author suspected that there could be the possibility of *A. ludlowi* playing some part in this connection. The studies carried out here show that although apparently Chilka Lake and its foreshore pools were favourable for *A. ludlowi* breeding, no specimens of *A. ludlowi* were seen anywhere in the area. It seems probable therefore that other factors are responsible for the variation in the incidence of malarial infection.

A large number of mosquitoes caught from dwelling houses were dissected for gut and gland infections with malaria parasites. Table VII gives the details of these dissections :—

TABLE VII

Species examined	Total examined	Gut infection	Gland infection	Total infected	Infection rate per cent.
<i>A. fuliginosus</i> ..	1,071	2	0	2	0.2
<i>A. pallidus</i> ..	74	0	0	0	0.0
<i>A. culicifacies</i> ..	54	0	0	0	0.0
<i>A. sinensis</i> ..	102	0	0	0	0.0
<i>A. barbirostris</i> ..	2	0	0	0	0.0
<i>A. tessellatus</i> ..	4	0	0	0	0.0
<i>A. aconitus</i> ..	18	0	0	0	0.0
<i>A. ramsayi</i> ..	45	0	0	0	0.0

It will be observed that out of the several species examined *A. fuliginosus* was the only one in which natural infection with malaria parasites was observed. The infection rate in the whole series mentioned here is very low indeed, but when one considers separately the results of dissection of *A. fuliginosus* collected from the different areas, some interesting information is available. The results of dissections are given below in four groups:—

- (i) Eight hundred and twenty-one dissections of *A. fuliginosus* from the vicinity of Khurda Road, a healthy place,
- (ii) One hundred and thirty-nine dissections from an endemic region of Chilka Lake villages with a high spleen rate and parasite index, but with a very low percentage of gametocyte carriers,
- (iii) Dissections of 64 *A. fuliginosus* from the hyper-endemic zone of Pipili, a village ten miles away from Khurda Road, with a high spleen rate (60 per cent.) and a parasite index and a high percentage of gametocyte carriers, and
- (iv) Consisting of a group of 47 mosquitoes from a very malarious place, Bhadrak, in the Cuttack district with a high parasite index and a large number of gametocyte carriers.

There is here an interesting correlation between the spleen rates of children of the

In batch four, out of 47 *fuliginosus* dissected one showed gut infection with medium-sized oöcysts, giving a natural infection rate of 2.1 per cent.

The contrast between these batches is striking. On the one hand we have a healthy place with extremely few gametocyte carriers resulting in an infection rate of zero of all the species dissected and especially of *A. fuliginosus* of which 821 were dissected. Ten miles away is a hyper-endemic zone, Pipili, with a high spleen rate and parasite index giving a natural infection rate of 1.6 per cent. for *A. fuliginosus*, while at another malarious station, Bhadrak, the infection rate of *A. fuliginosus* was 2.1 per cent. It has been shown by several workers in Bengal that *A. fuliginosus* is a good carrier of malaria in that Presidency under conditions usually associated with hyper-endemicity. This mosquito begins to increase from August and exists in vast numbers all through the malaria season. If this is the actual carrier, its prevalence closely corresponds with the incidence of malaria as shown in chart II. The other species were too low and too irregular in their prevalence to enable the author to draw a graph showing the variations in their seasonal incidence. Further work may elucidate the point whether *A. fuliginosus* is a carrier in the Orissa plain in much the same way as it is in deltaic Bengal.

TABLE VIII

Locality	Gross spleen rate per cent	Percentage of films containing a large number of gametocytes liable to infect mosquitoes	Number of <i>A. fuliginosus</i> dissected	Number infected	Infection rate per cent.
I. Khurda Road area ..	5.0 *	0.8	821	0	0.0
II. Chilka Lake area ..	40.0	1.2	139	0	0.0
III. Pipili area ..	60.0	24.0	64	1	1.6
IV. Bhadrak area ..	66.0	20.0	47	1	2.1

* The author is indebted for this figure to Mr. R. Senior-White, Malariologist, Bengal-Nagpur Railway, who took the spleen rate four years ago, before the anti-malarial operations were started.

villages and rate of infection with malaria parasites among *A. fuliginosus* collected from the same village. It is unfortunate that these observations could not be extended, and although these variations are based on a small number of positive specimens, the results are interesting and suggestive of further work.

In the first and second group all the *fuliginosus* dissected, namely 821 and 139 respectively, had no natural infection with malarial parasites.

In the third group out of 64 *fuliginosus* dissected one had large well-developed oöcysts in its mid-gut, giving a natural infection rate of 1.6 per cent.

In conclusion, the author wishes to express his great indebtedness to Mr. R. Senior-White and Lieut.-Col. R. Knowles for the encouragement and facilities they gave during the course of this work, to Dr. B. C. Das Gupta, District Health Officer, Puri, for his kind help during the survey of the Chilka Lake villages, and also to Dr. B. B. Chowdhury, Assistant Surgeon, Bengal-Nagpur Railway, for his great help during the course of this study at Khurda Road.

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APPENDIX I

Results of blood examination

	Name of village	Total number of slides examined	Total number of positives	B. T.	M. T.	Q.
1.	Jaripara	12	8	6	2	..
2.	Balinasi	5	4	1	3	..
3.	Bhidarpur	2	2	2	..	..
4.	Injanpur	14	14	9	..	5
5.	Barkul	26	22	4	14	4
6.	Swaran	14	2	..	2	..
7.	Hatabardhi	19	5	3	2	..
8.	Nairi	40	4	2	2	..
9.	Borlabandha	35	15	9	3	3
10.	Pipili	25	20	10	7	3

Numbers 1 to 9 are Chilka Lake villages.

THE PROGNOSTIC VALUE OF THE ALDEHYDE REACTION IN KALA-AZAR

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IN a series of papers Chopra and Chaudhury (1928, 1929, 1930) have shown that many of the pathological sera are characterized by high viscosity, diminished buffer action, and low surface tension as compared with normal serum. The sera from the blood of kala-azar patients show these abnormalities to a high degree. In an attempt to see when these properties attain their normal values during the course of treatment of kala-azar patients, it was found that even after a period of two months after the courses of injections are finished, the serum does not attain its normal value so far as these physical properties are concerned. Simultaneously with these experiments, Napier's aldehyde reaction has also been followed up in a quantitative manner and it has been found that this enables us to understand many otherwise inexplicable facts by differentiation of the times of gelation and complete opacity in this reaction (*loc. cit.*). Napier (1922) demonstrated the value of this reaction in the diagnosis of kala-azar, and it is now universally known. That the same reaction might be useful in indicating the progress of the disease towards cure is still only vaguely recognized. By differentiation of the times of gelation and complete opacity of kala-azar serum after the addition of formalin when the patient is under treatment, the reaction can be used as an indication of the progress towards cure.

Methods and results

To one drop of formalin (20 drops 1 c.cm.) in a test tube (capacity 5 c.cm., outer diameter

1.5 cm.) is added 1 c.cm. of serum, and the times of gelation and complete opacity are noted with an ordinary watch. After mixing the formalin and serum the time required to produce a gel, which does not flow when the tube is inverted, is taken as a measure of the process of gelation. The time to complete opacity is taken to be that which is required for the gel to become opaque to both reflected and transmitted light as described by Napier. With the specification described above, it is observed that when a drop of formalin and 1 c.cm. of serum are mixed, the time of gelation varies from a few seconds to about 18 minutes, depending on the stage of the disease.

TABLE I

Showing gelation time in one hundred untreated positive-aldehyde cases

Gelation time	Number
0-1 minute	52
1-10 minutes	43
10-18 minutes	5
	<hr/> 100 <hr/>

A perusal of the table shows that in about 95 per cent. of cases the gelation time varies from less than 1 to 10 minutes. In a series of cases given in table II we carefully noted this time during the course of treatment and afterwards. These patients belonged to both categories, i.e., ordinary cases of kala-azar who reacted well to treatment, and resistant cases who relapsed after treatment. They were examined every week to see how they were progressing and their blood was taken with a view to determining the time of opacity, gelation and other physical characters. In most of these cases we were able to carry out these weekly examinations for 8 to 9 weeks and in some for 3 months. The majority of these patients were in the wards of the Carmichael Hospital for Tropical Diseases under the charge of Dr. L. E. Napier; the diagnosis of kala-azar was made by demonstrating the parasite in the

peripheral blood or by spleen puncture. In most of these cases the treatment given was Neostibosan intravenously, usually the intensive course of 6 injections on 6 successive days, with a total dosage of 2.7 grammes being given.

It has been shown in a previous paper (*loc. cit.*) that the gelation time remains constant for about twenty to thirty days from the beginning of the treatment, whereas the time of complete opacity begins to increase much earlier than the time of gelation in each and every case. Patients in whom the time of gelation is observed not to increase after this period, although the time of complete opacity increases, are resistant (*cf.* table II).

treatment, if we only note carefully the time of gelation of the serum with formalin, during the period following the course of injections with antimonial compounds.

Discussion

Lloyd and Paul (1928) have shown that from about three to four weeks after the courses of injections are finished, the protein content of the serum that is precipitated by 33 per cent. ammonium sulphate decreases. Now from this time onwards, the time of gelation also shows a decided increase. It is, therefore, reasonable to assume that the protein which decreases from this time onward is responsible for gel-

TABLE II
Showing changes in gelation time of kala-azar cases with treatment

Showing changes in gelation time by treatment							
Class of cases	Number examined	AVERAGE GELATION TIME IN MINUTES					REMARKS
		Before treatment	AFTER TREATMENT				
			1 week	2 weeks	3 weeks	4-5 weeks	
Ordinary cases.	17	1.4	2	2.5	4.5	More than 30	Patients progressed favourably clinically.
Resistant cases.	4	2	2	2	2	2.5	Clinically made unsatisfactory progress. One of these patients had three courses of antimony injections. Two are known to have relapsed.

A perusal of table II shows that it is possible by noting the time of gelation alone to indicate in a general way whether the patient is progressing towards cure. If the gelation time commences to increase about three weeks after the course of injections has been completed, the probability is that the patient is showing a good response to treatment. It may be stated that when the gelation time exceeds half an hour one month after the course of the treatment, the probability of the patient's complete cure is satisfactory (*cf.* tables I and II). If the time is less than half an hour, it is better to compare the times of gelation of the serum before and after treatment. The time of gelation before treatment can easily be determined as a matter of routine when doing the aldehyde test for purposes of diagnosis. If the time after treatment is doubled, the progress of the patient towards cure is assured, though not to such an extent as when the time exceeds half an hour. It is, of course, clear that if the gelation time is increased within one month of the treatment, the progress of the case is favourable. What, however, is to be particularly noticed is the increase in the time of gelation and not so much its actual value.

Thus in a general way we can observe the progress of the patient towards cure with

formation. Chopra and Chaudhury (1931) have shown that this protein is probably not euglobulin, as it has an iso-electric point of about 7.0, but it is similar to euglobulin in so far as it is precipitated by salt solutions; so that the protein which is precipitated by 33 per cent. ammonium sulphate consists of euglobulin and the gel-forming protein mentioned above.

It is evident therefore that this gel protein is present in large quantities in kala-azar serum and only with its diminution can the progress of the patient towards cure be assured. Also the retardation of gel-formation and the diminution of this particular protein content of the serum run parallel, and both serve as an index of the rate of progress towards cure in kala-azar. The determination of the protein content is not possible for ordinary practitioners, whereas testing the formol-gel reaction in the way we have suggested is an operation that they can perform and thereby obtain some definite information regarding the progress of a kala-azar patient towards cure.

Conclusions

Our observations show that by noting the time of gelation of the sera from the blood of kala-azar patients with formalin it is possible

to indicate in a general way the progress of the kala-azar patients towards cure.

Information regarding progress towards cure may be said to be satisfactory if the time of gelation is more than half an hour. If, however, the time of gelation before treatment is known, and this can be easily determined when doing an aldehyde test for diagnosis, the corresponding increase of the time of gel-formation also gives useful information. Our thanks are due to Dr. L. E. Napier for his help and co-operation in this work.

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Note.—The test for cure in kala-azar is one of the most difficult problems the physician dealing with this disease has to face. There are no clinical or laboratory methods that will do more than indicate the probabilities. I would prefer to give a prognosis on information regarding the exact dosage administered to a patient rather than on any examination carried out on the patient himself, so frequently have I been misled by the various criteria of cure which have been adopted in the past.

Lloyd, Napier and Paul (1929) indicated that a prognosis might be made by watching the progress of the 'protein graph', but this is an elaborate method and it is possible that the simpler method suggested above may be of more practical value. However, more work will have to be done, as the cases so far tested have been few and the after-histories were not obtained, so that it is not known whether these patients were actually cured or not.

Any suggestion for throwing light on this particular problem is very welcome.

L. E. NAPIER.

ACRIFLAVINE AS A COUNTER-STAIN IN THE ZIEHL-NEELSEN METHOD OF STAINING

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 Bellary

ACRIFLAVINE is quite a useful counter-stain in the Ziehl-Neelsen method of staining, and I am at present using it at the Wellesley Sanatorium Jail which is an institution for tuberculous convicts. The solution is made up in a strength of 1:500 with distilled water, and the process of staining is carried out exactly in the same way as that described under the above method, except that acriflavine in the above-mentioned strength is used instead of methylene blue. I use the counter-stain for half to one minute. To obtain the best results, all the detail in the careful preparation and fixation of smears, as well as the selection of suitable

portions of material should be strictly attended to.

The advantages claimed for acriflavine as a counter-stain are that the bacilli stand out so clearly against the light-coloured background, and that they are not easily missed in smears where the bacilli are very scanty or stain feebly. Of course for the general study of a sputum smear methylene blue is the best counter-stain, as pus and other cells and elastic tissue stain only faintly with the acriflavine solution mentioned above, and other organisms are not at all identifiable. The tubercle bacilli are more maroon coloured than red when acriflavine is used.

A PRELIMINARY NOTE ON NEW TYPES OF CHOLERA 'PHAGE—TYPES D & E

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APPELMANS and Wagemans (1922), working with the typhoid and dysentery groups of organisms and bacteriophages that were active against them, showed very clearly that a secondary resistant culture which developed after lysis by one race of bacteriophage might still be lysable by other races of bacteriophage, and that this action was 'reciprocal'. They stressed that it was not due to the difference in the degree of virulence, but to the difference in the mode of action of various races of bacteriophage. d'Herelle (1926) confirmed and extended these observations. Gratia (1923) reported the presence of two 'principles' in his colon bacteriophage and showed that the action of these two principles was reciprocal. Hadley and Dabney (1928) and Hadley (1928) reported on the 'dual nature' of paratyphoid 'phage and termed the two principles as 'α' and 'β'. By selection from the discrete areas of lysis, pure-line 'α' and 'β' types of bacteriophages were obtained. The two types differed in the size and 'zonal characteristics' of the plaques. The 'α' type of bacteriophage was active against the cultures which developed after the action of 'β' type, and the 'β' type of bacteriophage was active on the secondary resistant culture that developed after the action of type 'α' bacteriophage.

Asheshov (1930) described three types of cholera 'phage, differentiating the types morphologically according to the size and characteristics of the plaques. The three types (A, B and C) of cholera 'phage possessed reciprocal action. The secondary growth that develops after the action of type A cholera 'phage on a sensitive and 'ultra-pure' vibrio is lysable by

PLATE I

Secondary cultures

A B C ABC D mixture.

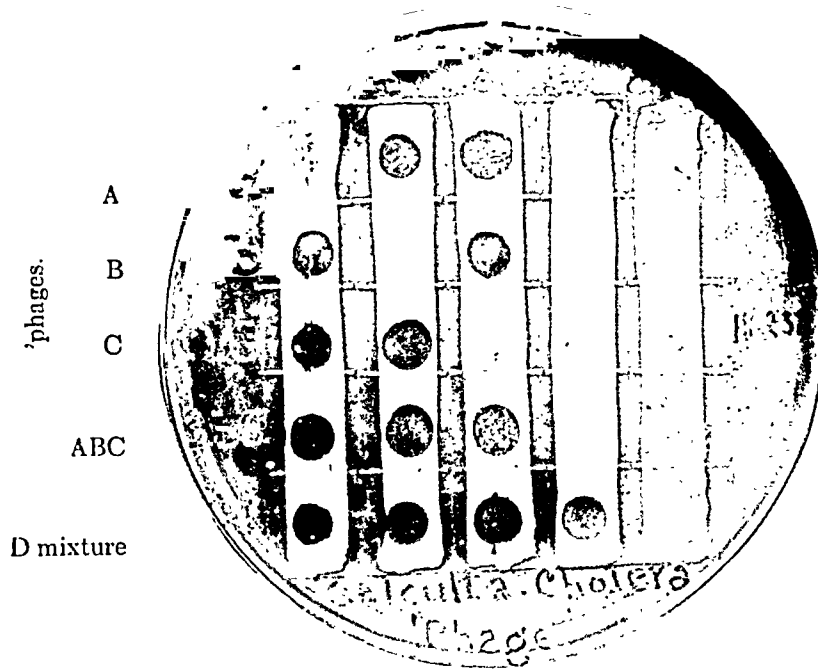


Fig. 1

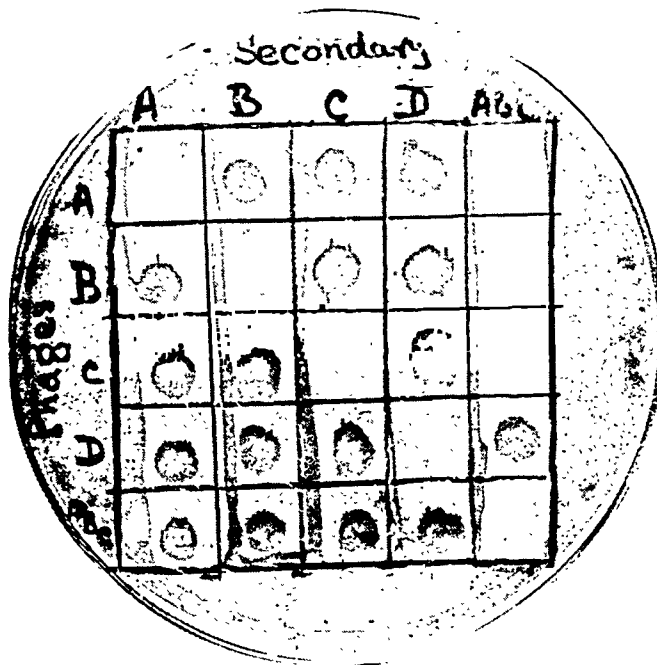


Fig. 2

types B and C, and is resistant to type A; the secondary growth after cholera 'phage type B action is lysable by types A and C; and similarly the growth resistant to cholera 'phage type C is lysable by types A and B. If a bacteriophage consists of two types of cholera 'phage then the secondary growth will be acted upon only by the type of cholera 'phage which was not present in the original bacteriophage. If the bacteriophage contains all three types (A, B and C) then the secondary resistant growth will not be lysable by any of the three types of cholera 'phage. Asheshov (1931) made an extensive search for a possible fourth type of cholera 'phage, but did not find one. He concludes by expressing the opinion that there exist only the three types of cholera 'phage.

In the last quarter of the year 1931 during the post-monsoon incidence of cholera we isolated from a number of samples of water from the river Hooghly a bacteriophage—'W' 'phage—which caused lysis of some strains of cholera-like vibrios. The secondary growths that developed after the action of this bacteriophage on some strains of cholera-like vibrios were lysable by cholera 'phage, although the original strains were resistant to cholera 'phage of the types A, B and C (Pasricha, 1932). This observation led us to investigate the possibility of there being other races of bacteriophages that would link up the types A, B and C with the W 'phage. We examined our collection of filtrates of cholera stools and water samples; these filtrates had been preserved in sealed ampoules in the dark at room temperatures. As we had a very large number of filtrates we pooled the contents of the ampoules into two flasks.

Filtrate group 1.—Containing a mixture of nearly 500 filtrates of cholera stools and water samples collected in 1931.

Filtrate group 2.—Containing a mixture of 50 filtrates of cholera stools and water samples collected in 1932.

The two filtrate groups were examined for the types of cholera 'phage and for the presence of any other bacteriophages active against cholera and cholera-like vibrios.

The result of this examination is summarised below :—

A. Unenhanced filtrates.—Both the filtrates, 1 and 2, contained all the three previously-known types of cholera 'phage (A, B and C).

Filtrate 2 also contained a bacteriophage which readily caused lysis of a secondary growth of a cholera vibrio which had been acted upon by all three types of cholera 'phage. Filtrate group 2 contained a new bacteriophage and we called this filtrate the 'D mixture' (see plate I, fig. 1).

Filtrate 1 also contained all the three types of cholera 'phages and in addition a bacteriophage which caused lysis of the secondary growth after the action of 'D mixture' on

cholera vibrio. This filtrate we called the 'E mixture'.

B. Enhanced filtrates.—Enhanced with cholera vibrio the filtrates gave similar results to the unenhanced filtrates except that the 'E' element in the 'E mixture' was often lost. The unenhanced filtrate caused no lysis of those strains of cholera-like vibrios known to be lysable by B 'phage, but after enhancement showed evidence of at least two races of bacteriophage allied to the W 'phage.

Purification of type D cholera 'phage.—Filtrate 2 or the D mixture was grown on the following two strains :—

1. Water vibrio No. 174, a smooth bacteriophage-free vibrio resistant to types A, B and C cholera 'phage and lysable only by the 'D mixture'.

2. A-B-C secondary culture, obtained after the action of cholera 'phage types A, B and C on cholera strain No. 618, a smooth bacteriophage-free cholera vibrio.

Six daily transfers were made on these two cultures and the seventh filtrate was plated out with an emulsion of a young culture of cholera vibrio 618 to obtain isolated areas of bacteriophage action. By selection of isolated plaques the new type of bacteriophage was obtained in a pure form. When cross-tested, according to the technique of Asheshov (1930), it gave the following results :—

Figure 1

Cross-test showing the reciprocal action of the new type—type D—of cholera 'phage.

Secondary culture

	A	B	C	D
A		○	○	○
B	○		○	○
C	○	○		○
D	○	○	○	

Type A cholera 'phage acts on the secondary cultures of types B, C and D cholera 'phage.

Type B cholera 'phage acts on the secondary cultures of types A, C and D cholera 'phage.

Type C cholera 'phage acts on the secondary cultures of types A, B and D cholera 'phage.

Type D cholera 'phage acts on the secondary cultures of types A, B and C cholera 'phage (see plate I, fig. 2).

Figure 2

Shows the type test according to Morison's (1931) technique.

Secondary culture

	B+C (-A)	A+C (-B)	A+B (-C)	ABC
A	○			
B		○		
C			○	
D	○	○	○	○

'phages

The new type D acts on the old -A, -B and -C, as these secondary cultures do not contain the D type.

This test modified to include type D gives the following result :—

Figure 3

Morison's test as modified to include the new type D cholera 'phage.

Secondary culture

	BCD	ACD	ABD	ABC	ABCD
A	○				
B		○			
C			○		
D				○	

'phages

Characters of type D cholera 'phage.—Type D bacteriophage is a much slower-acting cholera 'phage than type A. It causes complete lysis of some vibrios in about seven hours, and the lysis obtained is maintained for about four hours followed by the development of secondary growth. It appears to possess a greater range of virulence than any of the other types of cholera 'phage. It gives rise to clear-cut areas of 'phage action with no undermining of the edges. The lysis obtained with a bacteriophage containing types A, B, C and D is much more complete and is maintained for a longer period than with a bacteriophage containing only A, B and C.

The 'E mixture when tested for the types of cholera 'phage gives the following results:—

Secondary culture

	A	B	C	D	ABC	ABCD	'E Mixt."
A		○	○	○			
B	○		○	○			
C	○	○		○			
D	○	○	○		○		
ABC	○	○	○	○			
ABCD	○	○	○	○	○		
'E "Mixt."	○	○	○	○	○	○	

'phages

The 'E mixture' contains an additional type or types of cholera 'phage which cause lysis of the secondary culture of types A, B, C and D. This bacteriophage is still under investigation and we have some evidence that there are in it more than one type of cholera 'phage. The relationship of these types of cholera 'phage to W 'phage is being worked out.

Summary

A new type of cholera 'phage, type D, which possesses reciprocal action similar to that of the types A, B and C cholera 'phage described by Asheshov is described.

Evidence is presented to show the existence of one other or perhaps two other (E and F) types of cholera 'phage.

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A Mirror of Hospital Practice

EROSION OF THE SKULL BY AN INTRACRANIAL TUMOUR

By R. H. CANDY, M.R.C.S. (Eng.), L.R.C.P. (Lond.)

LIEUTENANT-COLONEL, I.M.S.

Civil Hospital, Ahmedabad

A young Mohammedan, aged 19, was admitted to the Civil Hospital, Ahmedabad, in January 1931. He had a swelling on the right fronto-parietal region which was soft and pulsating. The swelling lay over an obvious deficiency in the skull. The deficiency was approximately 2½ inches by 1½ inches. A small hole was also palpable above the right orbit of the size of the tip of the little finger.

The right eyeball was depressed, the palpebral fissure was narrowed, but proptosis was absent.

An examination of the retinae was kindly carried out by Dr. M. D. Ankalesaria on March 4th, 1932, who gave the following report:—

'Both eyes:—Pupils are active and tension normal. Temporal halves of both discs are atrophic'.

There were no other physical signs. Examination of the nervous system revealed no abnormalities. The mentality of the patient was somewhat dull, but did not markedly differ from that of any other person of his station in life. The case was diagnosed as one of meningioma. The patient absconded, but fortunately returned on March 2nd, 1932, in a condition differing little from that described, except that the tumour was somewhat larger and now pulsating strongly.

Operation was undertaken on March 15th under rectal ether reinforced by oral administration. The tumour revealed itself as a large hydatid cyst of the brain, and when it was removed the cavity must have occupied not less than one-third of the intracranial space. The brain began very slowly to expand. The patient left the theatre in good condition, but on the first night had three small fits; these were possibly due to small cortical hæmorrhages in the expanding brain.

Irregular pyrexia has followed and a copious sero-sanguineous discharge from the drain in the wound. Mentality and memory do not appear to be affected. No paralyses have occurred, though occasional tremors have been noticed in both right limbs.

The points of special interest in this case are as follows:—

(1) The presence of a hydatid cyst in the brain. Hydatid disease is not uncommon in this part of India, but it must be rare for the brain to be affected, apparently alone.

(2) The astonishing compression of the brain. To one who has not seen an example, it appears incredible that the brain can tolerate this degree of compression without the production of symptoms. In this case the absence of motor symptoms induced the belief that the tumour would be entirely frontal and the small hole above the right eye offered further evidence. Actually, the tumour went well back to the Rolandic area, or rather where the Rolandic area would normally have been.

(3) Above all is the fact that a hydatid cyst caused erosion of a large area of the skull. It was this erosion which appeared to clinch the diagnosis of meningioma. Not only was a large area of bone eroded, but the edges of the bone

were turned up and a feeble attempt at osteogenesis was in process.

These facts demand that some of our views should be remodelled.

FRACTURE OF THE CARPAL SCAPHOID —A RADIOLOGICAL STUDY OF THIRTY CASES

By MILITARY ASSISTANT SURGEON C. D. TORPY,

M.M.F.(B.), I.M.D.

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EVEN in such a standard textbook of surgery as that of Rose and Carless, the reader in search of knowledge on the subject of fractures of the scaphoid is disappointed and is perhaps led to think that such an injury is a *rara avis*.

Before I had the opportunity of working in a radiological department, such was my belief too; but it was not long before I had changed my views on the subject, and I hope that no apology is needed therefore for the publication on my part of a few notes on this interesting and common type of fracture.

Our lack of knowledge on this subject is no doubt due to the fact that radiological examinations of 'sprained wrists' were very seldom done in the past, and that such fractures seldom produced more than mild symptoms which were quite compatible with ordinary sprains. Even to-day, when x-rays are within the reach of us all, it is no uncommon event for one to meet with a case sent for radiological examination of the wrist, only after conservative treatment for a sprained condition has been carried out for a couple of weeks or more. Fractures of the carpal scaphoid have been better recognized in the Army, obviously because, as a routine measure, all cases of sprained wrists are radiographed.

The first point that struck me is how comparatively common this fracture is, for during the years 1929-31, I have demonstrated the lesion in no less than thirty cases.

Most of the cases were of the snapped-waist type with little or no displacement. In one case, the tripartite nature of the fracture with dislocation was a most unusual feature.

It is generally believed that osseous union in cases of fracture of the carpal bones rarely, if ever, takes place. The investigation of the truth, or otherwise, of this belief was the second point of interest.

Most of the cases of fractured scaphoid were re-x-rayed from two to six months after the occurrence—and in at least 50 per cent of them definite osseous union was noted: as a matter of fact, in quite a few cases, it was difficult to believe from the second skiagram that there had ever been a fracture at all.

The following is a list of the nature, and site of fracture seen in the thirty cases:—

- | | |
|---|----|
| 1. Snapped-waist type without displacement .. | 22 |
| 2. Snapped-waist type with displacement .. | 6 |
| 3. Fracture-dislocation (tripartite) .. | 1 |
| 4. Comminuted fracture .. | 1 |

Though the treatment of such fractures does not come within the province of a radiologist, it would perhaps not be quite out of place to include a few remarks on this subject from an article by Major C. M. Finney, O.B.E., R.A.M.C., in the *Journal of the Royal Army Medical Corps* in the issue for September 1931.

'It has been shown that the highest percentage of perfect results followed the use of splints; next came massage, so that the employment of some form of splint, and massage is certainly indicated..... Whatever type of splint is used it should control the wrist, but not the fingers and thumb, and should be worn for 3 or 4 weeks in simple cases. If there is marked displacement, the duration of splinting should be doubled. It should be accompanied by massage without movement and followed by both.

Operation should be reserved for cases with marked displacement or comminution, and for those in which disability persists in spite of the above treatment. The removal of the whole bone is not an easy operation, and the benefit is unlikely to appear before the lapse of several months'.

Conclusions

1. Fracture of the carpal scaphoid is a very common injury in the Army.
2. Osseous union does occur in at least 50 per cent. of cases.
3. Radiological examination of 'sprained wrists' should be undertaken to obviate the possibility of a fracture.
4. 'Treatment should be conservative, and the best results follow rest on a splint for three or four weeks'.

I take this opportunity of expressing my thanks to the Officer Commanding, British Military Hospital, Jubbulpore, for his kind permission to publish these notes.

ASPHYXIA PALLIDA

By BIMAL RANJAN DEY, L.M.P.

In-charge Charitable Dispensary, Narsingpur, Cachar

I WAS called in to see a case of difficult labour in a village near to my dispensary on 29th January, 1932. The patient was a multipara, aged about 40 years. The country dhai who was in attendance informed me that the child had already passed meconium.

On examination, it was found to be a case of breech presentation. An apparently-lifeless female child was delivered after extracting both legs in turn. There was a little delay and trouble in bringing out the after-coming head. The cord was severed at once and mucus was extracted from the mouth of the baby. She was put in a hot bath, an injection of a third part of 0.5 c.cm. ampoule of pituitrin was given, and the forefinger was then introduced in the rectum of the baby until the sphincter ani constricted. After a few minutes the baby began to breathe in a gasping

manner and after about 15 or 20 minutes she cried and subsequently breathed regularly. After waiting for another 15 minutes she was taken out of the bath, dried, wrapped in warm clothing, and handed over to the attendant.

The child and the mother are both still enjoying sound health.

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A CASE OF ILEUS

By M. UMAR

Fatchgarh, United Provinces

F. C., a prisoner in the Fatchgarh Central Prison in the United Provinces, aged about 50 years, was admitted to the jail hospital on 17th December, 1931.

He complained of constipation with pain in the abdomen, continuous and intense. There was not even discharge of gas. The abdomen was distended and globular in shape below the umbilicus. Nausea was present, but no actual vomiting; the face was drawn and anxious; the pulse was rapid and feeble; the eyes were sunken, the skin cold, and the tongue dry and parched.

He refused operation despite all my efforts at persuasion. He suffered the penalty of his refusal and died on 20th December, 1931.

I performed the post-mortem examination the same day. The abdomen was full of dark red fluid. About a foot of large intestine had prolapsed through a hole in the great omentum; this portion of the intestine was gangrenous and had given way. Constricting bands formed by the great omentum were encircling the gut in different places, so the cause was the strangulation of the large gut due to these bands.

I described a similar case in the *Indian Medical Gazette* of December 1927, but in that case I was allowed to operate and simply by cutting the band his trouble was removed.

CONGENITAL BILATERAL ABSENCE OF THE RADIUS AND THUMB

By A. R. D'ABREU, L.M.S.S.A. (Lond.), I.M.D.

Civil Surgeon, Gujrat District, Punjab

In the September issue of the *Indian Medical Gazette* for the year 1930 I reported a case of congenital bilateral absence of the radius and thumb in an adult. I have since come across another case, a newly-born full-term male infant, who was brought to the Civil Hospital, Gujrat, in November last year.

There was shortening of the forearms with complete absence of the thumb on either side, and the wrists along with the hands articulated laterally with the radial side of the ulnas. Palpation revealed no metacarpal bone of the thumb and complete absence of the radius on both sides. No vestigial stump of the latter bone could be felt at the elbow although a very careful examination was made. The ulnas were bowed and in size appeared about one-third shorter than normal. The external musculature of the forearm was poorly developed, and the wrist and finger joints were flail-like. The power of flexion was present in the wrists and fingers, but hardly any active extension could be elicited. But for the deformity of club hand from absence of the radius and thumb bones, the child appeared very well developed and the features were exceptionally sharp for a newly-born baby. The child

was the first born to the parents, who were young and healthy, and there was no history of deformities in any of the near or distant relations or ancestors. Owing to absence of apparatus in Gujrat, a skiagram could not be taken.

I have to thank Dr. K. S. Thapar, P.C.M.S., Assistant Surgeon of the Civil Hospital, Gujrat, for his forethought in detaining the case.

DISINTEGRATED FŒTUS DISCHARGED THROUGH ABDOMINAL WALL

By BRIJBHUSHAN LAKHOTI, L.M.S., P.M.S.
*Medical Officer In-charge, District Hospital, Gorakhpur
United Provinces*

M. T., aged about 27 years, a Hindu female, was admitted into the Dufferin Hospital, Gorakhpur, on 4th December, 1930, for fever, cough, and œdema of lower extremities and an open foul-smelling wound below the umbilicus. The patient was in a very exhausted condition.

Her previous history was that she had been pregnant for 10 months. About 20 days previously she had a

The pieces were removed by Major J. B. Vaidya, L.M.S., Civil Surgeon, Gorakhpur, and it was found that the lower end of this wound communicated with the vagina. Its walls were closed on all sides, and any further dissection and exploration was considered very undesirable.

It was apparently a case of retention of dead fœtus in the uterus, and after the formation of adhesions to the abdominal wall sloughing of the uterine wall with discharge of the foetal bones on the surface. The communication with the vagina makes this more likely than ectopic pregnancy. The patient died on 12th December.

In the *British Medical Journal* of 4th July, 1931, a similar case was described, but in that case the bones were discharged *per vaginam*.

No post-mortem examination was allowed.

A NOSELESS MAN

By K. G. KHANDEKAR, M.B., B.S.
Civil Hospital, Mandsaver

I AM herewith sending a photograph and an x-ray film of a man who has complete absence



sudden acute pain in the back followed by a watery discharge from the vagina. The wound below the umbilicus was a sort of crater discharging offensive fluid in which pieces of the bones of a fœtus could be seen.

of the external nares. He is sixty years old. His power of smell is all right and when he gets a cold there is a watery discharge from his eyes and mouth. So far as he can remember he has

had no chest complaint, like pneumonia. He has normal teeth. He has a rudimentary penis, and once he was operated on for stone in the bladder.



The nasal bones are well seen in the x-ray film.

At the time of taking the photograph the man voluntarily closed his mouth.

A CASE OF RAT-BITE FEVER.

By KIDAR NATH DUTT, L.S.M.F. (Pb.), L.O. (Mad.)

*In-charge, Bahadurgarh (Rohtak) Dispensary
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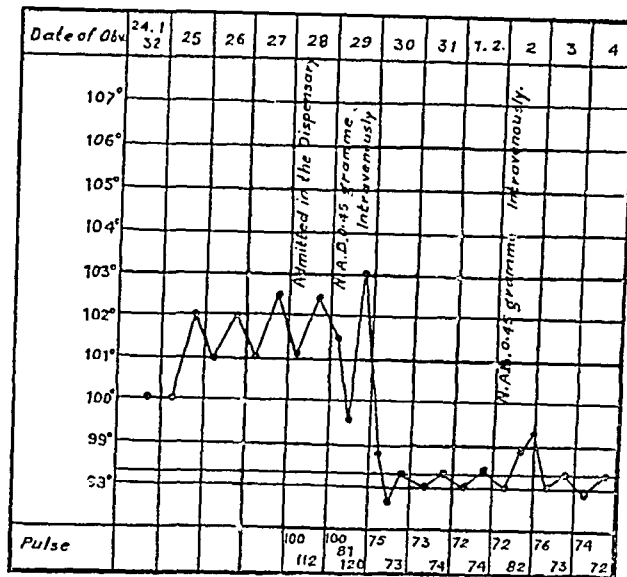
D. R., aged 25, an agent of a local business firm, presented himself at this dispensary on 28th January, 1932. He gave a history that he was bitten by a rat on the right side of his head while sleeping in his room on 15th January. Next morning he went to a barber and got some ointment to apply to his wound, which was somewhat painful. He used that ointment for about a week, but his pain increased. On 24th January, he developed fever with headache and pain in the neck. For the next three days his temperature ranged between 100°F. and 101°F. He took 10 grains of quinine on the 26th and 27th. He could not sleep on account of pain in the wound and in the neck on the night of the 27th.

He attended the dispensary on 28th January, 1932.

On examination I found that on the right temporal region, the place of the rat bite, an area about 1½

inches in diameter was swollen, slightly fluctuating, painful, and tender. The cervical glands on the same side were definitely enlarged and also painful. Bowels were constipated, the tongue coated and furred, the temperature 101°F. at 9 a.m. and pulse 100 per minute. On physical examination no other abnormality was found.

On clinical grounds, the diagnosis of rat-bite fever was made. He was admitted into the dispensary. He was given a diaphoretic mixture four-hourly. A blue pill, grs. 4, was given at bed-time followed by an ounce of magnesium sulphate next morning. His



temperature in the evening rose to 102.5°F. with pulse 112 per minute. Locally, ichthyol, belladonna and glycerine were applied and fomentations ordered. On 29th January, he was given an intravenous injection of novarsenobillon 0.45 gramme. The temperature in the morning was 101.3°F., and pulse was 100 per minute. Local and general treatment of the previous day was continued. The temperature in the evening fell to 99.5°F. with pulse 81 per minute, but it again shot up to 103°F. with pulse 120 per minute at 10 p.m. His general condition remained the same.

On 30th January, 1932, the morning temperature was 97.8°F., pulse 75 per minute, and general condition good. The pain and tenderness became less, swelling subsided and the patient felt comfortable. The pulse and temperature on that evening remained normal. Ten grains of quinine were given. Locally ichthyol, belladonna and glycerine, and fomentations were continued.

On 31st January, 1932, temperature was normal. He was put on Easton's syrup which was continued for the next three days. On 2nd February, he was given another intravenous injection of novarsenobillon 0.45 gramme. There was a slight rise of temperature and some reaction. The temperature fell to normal next day, and he was discharged cured on 4th February, 1932.

The points of interest are :—

1. A definite history of rat bite.
2. A definite local lesion.
3. Specific effect of novarsenobillon.

Special Articles

THE DETERMINATION OF SEX*

By C. A. GILL, F.R.C.S., D.P.H.

LIEUTENANT-COLONEL, I.M.S.

Director of Public Health, Punjab, Lahore

ALTHOUGH the subject-matter of this address may represent an unusual choice, there are several reasons why a discourse on the subject of the determination of sex should prove of interest.

I do not refer to the fact that anything to do with sex makes a wide appeal, and if anyone thinks that I am going to deal with the subject on the lines of a sex-appeal cinema film, he is doomed to disappointment. The subject of the determination of sex has intrigued the popular imagination ever since man began to speculate upon his origin. It has necessarily been a subject of special interest to physicians and more especially to metaphysicians. There are however three special reasons which render it a peculiarly appropriate subject for consideration at the present time. In the first place it behoves everyone, in whatever branch of medical science he may be engaged, to keep abreast of the times and to know something about demography or the science of populations; secondly the determination of sex is a matter upon which men of science and others have exercised their ingenuity for many years, and, as we shall see shortly, a whole host of theories—plausible and otherwise—have been put forward to explain the causation of sex. Thirdly, as the result of modern scientific research, much of the mystery and some of the obscurity in regard to sex determination has been dissipated, and the methods employed serve to illustrate in a remarkable manner the unexpected light that the academic study of biological phenomena is capable of throwing upon obscure problems of human pathology. I propose in this lecture to elaborate these points. In regard to demographical problems, I suppose there is no one who is not interested in the future of his race and country:

'Is there a man to fame so dead
Who never to himself has said
This is my own, my native land'.

Now it is obvious that the future of races and of nations is largely dependent not only upon the quality and quantity of the population, but also upon the maintenance of a proper balance between the sexes, for on the latter depends not merely the man-power of the race but also its moral and eugenic integrity and well-being.

The question therefore of the sex ratio is a matter of considerable eugenic importance and it is therefore a subject upon which medical men should possess special knowledge and be in a position to express considered views.

Let me illustrate my point by means of a few salient facts. In England and Wales (population 40 millions) there are 1½ millions more women than men, whilst in the Punjab (population 22½ millions approximately) there are roughly 2 millions more men than women. In Great Britain the number of male births exceeds the number of female births in the ratio of 103 : 100. This is termed the secondary sex ratio, the primary sex ratio being the ratio between the sexes at the time of conception. The male death-rate in Great Britain, as indeed in almost all countries, exceeds the female death-rate during the first few years of life. In England and Wales males outnumber females up to 20 years of age, but thereafter the proportion of female deaths steadily increases, largely because the death-rate at almost every age-period is higher amongst the males, so that, in the

case of persons over 80 years of age, there are about two women for every man; in other words the secondary sex ratio, which was at birth 103 : 100, sinks to about 50 : 100 at 80 years of age and over.

In the Punjab the state of affairs is very different; the secondary sex ratio (at birth) is approximately 112 : 100; in other words it is much higher than in Great Britain. It might thus be concluded that in a country where the male population is already in great excess, Nature, instead of attempting to re-dress the balance, is bent on increasing the disparity between the sexes. A less recondite but more likely explanation of the relatively high sex ratio at birth in the Punjab is the fact that male births are registered more completely than female births and it may be also that female infanticide, which still prevails in certain districts, is in part responsible.

The male population of the Punjab exceeds the female population at all ages, but the striking thing about the Punjab is the fact that, although up to 5 years of age the male death-rate, as in most other parts of the world, exceeds the female death-rate, the female death-rate from 10 years onwards is much higher than the male death-rate at all age-periods. In other words after 10 years of age females die more frequently, and earlier than males, so that the sex ratio at 60 years is 132 : 100 as compared with 112 : 100 at birth. Furthermore, matters are not improving since every healthy year—and we have had four in succession since the year 1927—adds steadily to the disproportion between the sexes, the estimated excess of males over females at the end of December 1930 being 2,051,469 as compared with 2,000,201 at the end of the year 1927. These facts serve to illustrate the supreme importance of improving the lot of the female population and it is on this account that maternity and child welfare work is of special importance in the Punjab. We thus see that the disparity between the sexes both in England and Wales and in the Punjab is considerable and that in the latter the paucity of females is a matter of concern. We see that male births outnumber female births in both countries and we want to know the reason for this. We also see that the male child is the more delicate and here again we should like to know the reason—whether Nature or heredity. Finally we see that in England females live longer than males, whilst in the Punjab women age more rapidly and die earlier than men. The explanation of this latter fact is not far to seek. It indicates an unsatisfactory and unhealthy state of affairs which loudly calls for remedial measures. The bearing of these facts upon the determination of sex is however only indirect, but the occurrence of a great disparity between the sexes serves to emphasize the need of precise knowledge regarding the factors concerned in determining the sex of the child and the maintenance of a proper ratio between the sexes. Numerous theories have been held in regard to the problem of sex determination and many have thought that they could regulate the sex of the child. Many of these theories were based upon the belief that there are two kinds of ova—male and female—which, when fertilized, are destined to give rise to males and females respectively. This theory is known as Schultze's theory. Then there is Rumley Dawson's well-known theory which postulates that the ovaries function alternately at each menstrual period and produce ova destined to become male and female children respectively. According to this view it is only necessary to note the sex of the first offspring and to relate the conception associated with it to a particular menstrual period to be in a position to determine the sex of any subsequent child. A variant of this theory was that both ovaries function synchronously, but one produces male ova and the other female ova, the sex of the offspring in this case being determined by the direction of flow of the semen.

Another widely-held theory—known as the Hofacker and Sadler's law—is that when the male parent is the older the offspring are predominantly male, whilst if the parents are the same age or if the male parent be

*A lecture delivered before the Punjab Branch of the British Medical Association at Lahore on January 27th, 1932.

the younger, female offspring predominate. Another confidently-held hypothesis, known as the theory of Girou, postulates that the sex of the offspring is predominantly that of the more vigorous parent, while Starkweather put forward the theory that the sex of the child is the opposite of the 'superior' parent.

It is clear that in a problem, where, as there are only two sexes, there is always a 50 : 50 chance of being right, much statistical and other evidence in favour of any theory being correct could readily be obtained, and it is therefore not surprising that all these theories still have many supporters both amongst laymen and medical men. But whether they are true or not, they represent little more than guesses without any biological basis, and consequently no real progress was made until the problem was tackled from the standpoint of observation and experiment.

Modern scientific knowledge of the mechanism of sex determination entered upon a new phase in the early part of the present century as the result of the work of Mendel. It is now known that all theories based upon the assumption that the female was the controlling factor in determining the sex of her offspring were erroneous. It has in fact been abundantly proved, in mammals at any rate, that it is from the father that the sex of the child is derived. This discovery was made by biologists who have shown that the sex-determining mechanism is linked with the chromosomes which are the physical bases of inheritance.

The chromosome is not a mental concept but an objective reality, which in consequence is capable of ocular demonstration. Chromosomes are, as you are aware, the tangled skein of matter present in the nucleus of the dividing cell which, because it takes up certain stains readily, is called chromatin (colour). It is a startling fact that the number of chromosomes is constant in each species—the number in man being 24. It is also a significant fact that these chromosomes occur in pairs, similar in origin and structure, and—except in the case of one pair—they are alike in the two sexes. In the pair that differ the difference often consists of the presence of a pair in one sex (usually the female), and a single chromosome in the other. These chromosomes are known as the sex chromosomes and the individual sex chromosome is known as the X chromosome. In many forms the difference consists in the presence of an identical pair in one sex (X X) (female) and in the other of one chromosome with an unequal mate (male), the X Y chromosomes. In these cases therefore male tissues can be distinguished from female tissues by reason of the presence in the nucleus of dividing cells of either a pair of similar chromosomes (X X chromosomes) in the female, or of an X and a Y chromosome (X Y chromosomes) in the male. In ordinary growth the cells divide and each daughter cell contains the full complement of chromosomes, because each chromosome splits longitudinally. In man therefore each parent cell and each daughter cell contains 24 pairs of chromosomes. But in the case of those cells—ova and sperms—that are going to form gametes the chromosomes undergo a 'reduction division', so that the ripe gamete only contains one member of each pair of homologous sex chromosomes. In man therefore the ripe egg or sperm contains only 24 single chromosomes instead of 24 pairs of the sex chromosomes. This implies in the case of the sex chromosome that the ripe gamete will contain in the case of the female only one X chromosome, whilst in the case of the male there will be two sorts of sperms one including an X chromosome and the other including a Y chromosome. In short whilst all the ova will be X-bearing, the sperms will be of two kinds, half being X-bearing and half Y-bearing. The male is thus digametic and the female monogametic, and the sex of the new individual formed from the union of an ovum and sperm will depend upon whether the X-bearing ovum was fertilized by an X-bearing sperm—thereby producing a female (X X) or by a Y-bearing sperm, this giving rise to an X Y (male) offspring.

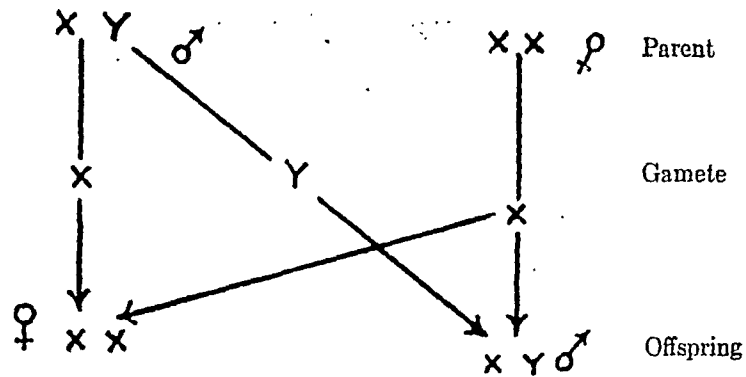


Fig. 1

We thus see that sex is determined at the time of fertilization by means of the sex chromosome mechanism, and that it is the male parent who determines the sex of the child. This discovery, as I mentioned earlier, has been the means of throwing light upon certain aspects of human pathology. In colour-blindness and haemophilia, for example, which are examples of sex-linked recessive characters, their occurrence can be understood if it be assumed that the hereditary factor for these conditions is attached to one of the chromosomes of one of the parents. Thus if the colour-blind factor is attached to the X chromosome of the father, the inheritance of colour-blindness can be traced and foretold. On the assumption that the factor for colour-blindness is attached to the X chromosome, the Y being neutral, it is possible to explain the peculiar features associated with the inheritance of colour-blindness and indeed of other inherited defects, such as haemophilia and pseudo-hypertrophic muscular paralysis. For example, when a colour-blind man (X^y Y) marries a normal woman, the sons will be normal and the daughters, although not colour-blind themselves, may give birth to colour-blind children. Such women are known as carriers. This may be illustrated diagrammatically in figure 2. Let X represent X with the factor for colour-blindness, then:—

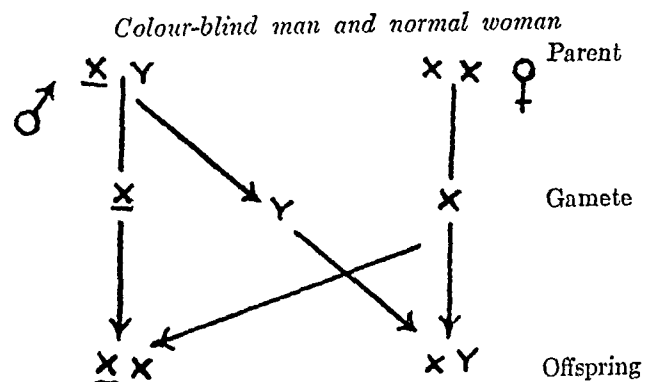


Fig. 2

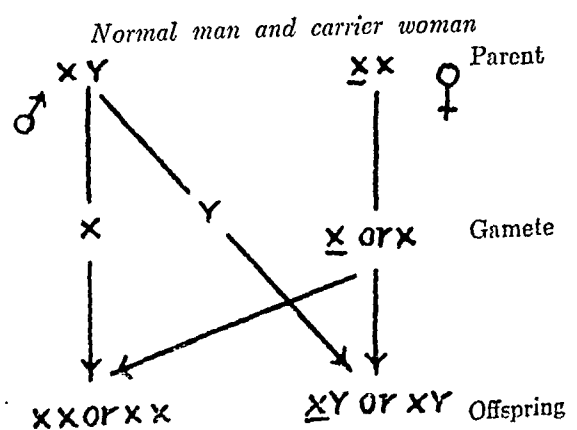


Fig. 3

In the case of the daughters ($\underline{X} X$) the recessive character attached to \underline{X} is neutralized by X and hence the woman is not colour-blind herself.

When a normal man marries a carrier woman there is an equal chance of the daughters being normal or carriers, but none will be colour-blind, whilst in the case of the sons there is an equal chance of their being normal or colour-blind. The diagram makes this clear.

When a colour-blind man marries a carrier woman the daughters will either be colour-blind or carriers, whilst the sons will either be normal or colour-blind: in both cases there is an equal chance of their being happenings. This is shown in the diagram below:

Colour-blind man and carrier woman

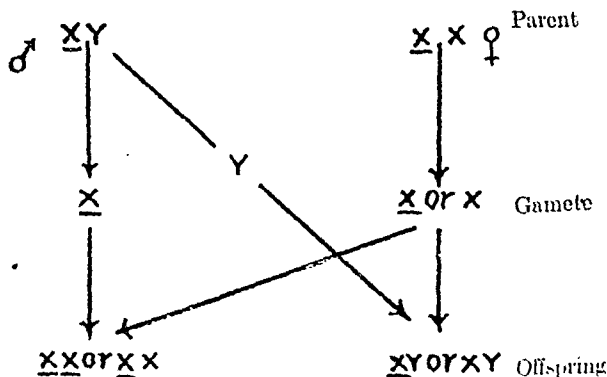


Fig. 4

There can thus be two kinds of males, $\underline{X} Y$ colour-blind, and normal males $X Y$, but there may be three kinds of women $\underline{X} \underline{X}$ colour-blind, $\underline{X} X$ carrier, and $X X$ normal. X counterbalances \underline{X} in the female—hence to be colour-blind she must have a double dose ($\underline{X} \underline{X}$), but in the case of a man, Y being neutral, \underline{X} or a single dose suffices, hence colour-blindness is more common in men than in women, but the defect may be transmitted by healthy women.

On the basis of the mechanism there should be bearing gamete being fertilized by an X - or a Y -bearing sperm—hence one would expect the number of the sexes to be equal. In all countries, however, it would seem that the secondary sex ratio—the rates of the sexes at birth—is not absolutely equal—103 : 100 in Great Britain. It would furthermore appear, although the data are inadequate and of doubtful value, that still-births are more common amongst boys than girls and that deaths amongst male foetuses from the 3rd month onwards are even higher. It is possible therefore that the primary sex ratio may be in the neighbourhood of 150 : 100 and it would thus appear that far more boys than girls are conceived. It is not easy to offer an explanation for this fact, and although the discovery of the sex chromosome mechanism has been the means of throwing much light on the determination of sex, there is obviously more to be learnt before we can claim to understand the subject completely. These recent discoveries open up possibilities in the sphere of the artificial control of sex should such an interference with Nature be necessary. As the two kinds of sperms are believed to possess slightly different qualities, it has been suggested that it might be possible to favour one kind of sperm by creating an artificial chemical field in the vagina. It might in this manner become possible to ensure that the result of fertilization shall be a male or a female. Who knows what the future may have in store? It may be that, in addition to birth control, we shall have in operation sex control. I do not know whether this would be a desirable state of affairs or not, but in India, I fancy, it would lead to such a great dearth of females that it would become necessary for the State to step in and to limit by

statute both the number of the family and its sex composition! It is premature to dwell on these unpleasant possibilities, which, after all, are merely the by-products of a search after knowledge which, if properly used, is calculated to eliminate personal and social disharmonies and to add to the happiness and well-being of the human race.

THE RETICULO-ENDOTHELIAL SYSTEM AND SOME DISEASES IN THE TROPICS

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CASES of splenomegaly, enlargement of the lymphatic glands and anaemia of unknown causation frequently come for treatment and the diagnosis is extremely difficult even in a most up-to-date hospital. The difficulty in most cases arises on account of the presence of the transitional and intermediate forms of some of the diseases of known entity affecting the spleen, lymphatic system, bone-marrow and blood. These belong to a system in the body which is of growing importance to the medical man in general. For the last fifteen years the anatomists, the pathologists and the clinicians have all been engaged in the study of this system. Scores of papers from different laboratories throughout the world have their basis on the relation of this system to the various infections. The ordinary medical man cannot follow these papers as there are many new terms, complicated theories and conflicting opinions. Every medical man interested in scientific work should understand the basic principle, however, for it applies to various branches of medicine. The subject is of the greatest interest to practitioners in the tropics for it involves a large number of tropical diseases. For this reason a concise review of the subject is given herewith.

Ranvier described the powers of phagocytosis by certain free connective tissue cells in 1891.

This phagocytic power was further observed by Metchnikoff and he recognized that the large cells of the splenic pulp and lymph nodes, certain endothelial cells (like Kupffer cells of the liver) and that some of the large mononuclear cells of the blood stream were phagocytic. The production of immune bodies and resistance to diseases were attributed by him to the special property of these cells.

A further step in the study of these cells was due to an accidental discovery by Ribbert in 1904 who was surprised to find that if harmless dyes were injected into the blood stream a certain set of cells only was stained and all the body cells were not equally stained. It was subsequently found that the stained cells were the cells described by Metchnikoff as phagocytic and as producing immune bodies. This discovery created a great deal of interest and it was soon corroborated by a number of

observers in different parts of the world. In 1913 Aschoff and Kiyono collected all the observations made up to that time and added the fact from their own experimental work that these cells were related anatomically and physiologically. The term reticulo-endothelial system was chosen to designate this group of cells. The cells comprising this group belong to four groups.

(a) Reticulum cells—these are large pale-staining cells found in the splenic pulp, cortical nodule and pulp cords of lymph nodes and other parts of the lymphatic apparatus. These cells play an important part in the function of the system. These cells take a deep stain by vital-staining methods, and this does not depend on whether they are independent or endothelial or connective tissue in nature.

(b) This group comprises the cells lining the sinuses of the lymph nodes, the blood sinuses of the spleen, the sinusoids of the liver lobules (Kupffer cells), the capillaries of the bone-marrow, adrenal cortex and hypophysis. These are endothelial in nature.

(c) This group consists of the wandering phagocytic cells of connective tissue (first described by Ranvier). The discovery of this group of cells was the keynote to all the researches in connection with this system.

(d) This group comprises the phagocytic mononuclear cells of the blood stream. Perhaps only a part of the total mononuclear cells in the blood represents this system.

A further advance in the study of this system was made by Sabin and her co-workers in 1925 when 'supra-vital' technic was introduced in the study of the mononuclear phagocytic cells of the blood and tissue. The method adopted was that neutral red and Janus green were allowed to dry in a thin film on microscopic slides. Tissues or body fluids such as blood or exudates were placed on the slides and sealed under a cover-slip with vaseline or low melting point paraffin. The preparations were kept at body temperature and examined under a microscope. In this way monocytes and clasmatoocytes are differentiated, the former originating from the primitive reticular cell and the latter from the endothelial cell.

Regarding the function of this system, it may be said that it plays a very important part in combating an infection locally by phagocytosis, and generally by the formation of anti-bodies. The so-called specific cure by certain chemicals depends on the formation of anti-bodies by the stimulation by the drug of the reticulo-endothelial system. The formation and destruction of blood and the production of bile-pigment depends on the proper functioning of this system. It reacts to certain infections and takes part in the process of inflammation and repair. It functions in disordered lipid metabolism, and pathological hypertrophy of the spleen is the manifestation of the excessive strain

on the system in disordered lipid metabolism in diabetes mellitus, Gaucher's disease and Naunimpick's disease. There is a possibility that it may lead to the formation of tumours. According to some, there is an internal secretion which holds in check the blood tumours as seen in leukæmia, Hodgkin's disease and in some types of sarcoma. This has been named the reticulin or mesenchymen. Thus it is clear that the cellular elements of the blood are under the control of the reticulo-endothelial system. Constantly a production within physiological limits is going on of red blood corpuscles, white blood corpuscles and platelets and also a destruction. Any deviation from these limitations whether above or below normal must be considered as pathological. The pathogenesis is not always evident as a pathological picture. A balance is being maintained, and if the blood diseases are viewed from the dynamic standpoint of the constant interplay of the blood-forming and blood-destroying apparatus, we find that a disturbed erythrolytopoietic balance results in pernicious anæmia, Banti's disease, hæmolytic jaundice and polycythæmia vera; a disturbed leukolytopoietic balance setting up various forms of leukæmia and a disturbed thrombolytopoietic balance giving rise to idiopathic purpura hæmorrhagica. Action and reaction play together in upsetting this balance by their stimulus and various transitional and intermediate forms are the results. This explains certain pathogenesis in some atypical blood diseases.

Regarding some other tropical diseases, an obscure relation exists between the infection and the reticulo-endothelial system. The infection and cure of malaria, leishmaniasis and the disease known as blackwater fever are very closely related to the system. Certain bacterial infections such as enteric fever, plague, Malta fever all have their brunt of attack on this system. Then again a chronic infection with tuberculosis and leprosy have their relationship to the reticulo-endothelial system, the former affecting the lymphatics and the latter the endothelial cells. The splenomegaly in all conditions is due either to a disturbed condition of the reticulo-endothelial system or of the hæmopoietic system. The so-called tropical splenomegaly of unknown ætiology is the manifestation of the allergic phenomenon of this system due to repeated infection by malaria. Infantile cirrhosis of the liver is also regarded as a kataphylactic reaction of this system in the liver by the outpouring organisms and toxins from the gut with a disturbed permeability being caused by defective diet and want of vitamins. On the other hand in the helminthic infection of filariasis, the nematode is harboured in the lymphatic apparatus and the disease manifestations are only the results of some associated infection disturbing the equilibrium.

Indian Medical Gazette

MAY

THE NURSES' CHARTER

AN event of extreme importance to the nursing profession in Great Britain is the publication last February of the 'Final Report of the *Lancet* Commission on Nursing'.* The Commission was appointed in December 1930 'to inquire into the reasons for the shortage of candidates, trained and untrained, for nursing the sick in general and special hospitals throughout the country, and to offer suggestions for making the service more attractive to women suitable for this necessary work'. The Commission was a very strong one; its chairman was the Earl of Crawford and Balcarres, F.R.S., and its members included Professor Henry Clay of the University of Manchester, Miss Darbyshire, Matron of University College Hospital, Professor F. R. Fraser of St. Bartholomew's Hospital, Dr. Robert Hutchison of the London and Great Ormond Street Hospitals, Miss Edith Thompson of Bedford College, and Sir Squire Sprigge, Editor of the *Lancet*. The Commission held 24 plenary meetings, whilst the various sub-committees held an additional 25 meetings. Questionnaires were issued to the responsible authorities of hospitals throughout the country, also to trained nurses working in hospitals, to probationers known to have had a good secondary education, and evidence was taken from headmistresses of girls' schools, and further questionnaires sent to groups of girls still at school, and to older girls who had left school. Thanks to the publicity given to the Commission by the British Press voluntary information poured in, and the bulk of the evidence collected relates to the conditions of a nursing staff numbering 44,000 and employed in 686 hospitals.

In the introductory chapter, the Commission state that their object has been adaptation rather than fundamental reconstruction. Hitherto patients have not suffered from the shortage of nurses, chiefly owing to the willingness of the existing nurses to work overtime. In the London voluntary hospitals the shortage is least acute, and many of them have waiting lists, but even here there is a shortage in securing staff nurses of the standard required. In the provincial and municipal hospitals the position is more acute. One important cause of wastage is that many hospitals admit probationers, a large percentage of whom prove to

be unsuitable during their first year of service and have to be dismissed. It is important to note that the shortage is not only in numbers, but in quality; the well-educated girl of good social status does not regard nursing as an attractive career; she can have a brighter and less laborious life in some other profession. Conditions of training and service have fallen into relative disfavour with young people and their advisers, and, although prejudice against them is partly based on ignorance of improvements, the dark picture that has been painted will not fade until it is obviously untrue to life in every hospital in the country.

One factor which leads to the resignation of many probationers is the attitude of the senior nurses in many hospitals towards them. Senior nurses commonly regard long hours of routine work as an important part of the training, and the probationer gets insufficient time for leisure and study. Many senior nurses hold also that the qualities essential to a nurse are best fostered by strict discipline, in the nurses' home as well as in the wards. The young probationer, eager to learn, may be disheartened by being kept at work which bears no direct relation to the care of the patient, while getting little instruction in nursing.

Women in other professions, notably headmistresses, and nurses with wide general experience, complain that the hospitals do not cater intelligently for the type of girl that they seek to enlist for training and that some of them lay themselves open to the charge of exploiting student labour. It is claimed that the educational methods still practised in hospitals have been largely superseded elsewhere by others which rely on arousing—instead of damping—curiosity, initiative and interests outside the daily work. As one witness put it, the young probationer is 'put in blinkers'. What worries the nurse-student perhaps more than anything else is the contrast between the responsibility placed on her in the wards and the lack of confidence reposed in her when she is off duty.

The consensus of opinion among the witnesses examined was that 18 is the youngest age at which a girl should commence training as a probationer. Before the War the age was 21. This means that in the majority of cases there is a gap between the age of 16, at which the girl leaves school, and her commencement of her nursing career. During this period many girls who would otherwise take up nursing enter other careers, embark on social life, acquire latchkeys of their own, become 'bachelor girls', and come to view with distaste the idea of a strictly-disciplined life in a nurses' home. To remedy this, the Commission recommend an extensive trial of combined maintenance and scholarship schemes throughout the country for girls of 16 and upwards; the general education of those selected for maintenance or scholarship grants should be

*The *Lancet* Commission on Nursing, 1932. The *Lancet*, Ltd., 7, Adam Street, Adelphi, London, W.C.2. Price, 2s. 6d. net, plus postage.

continued, and they should attend classes in elementary science, anatomy, physiology, and hygiene, and visit hospitals, the courses of study and the institutions to be attended being approved of by the General Nursing Council. There is scope for every sort of talent, and interest should be aroused in would-be administrators and health workers as well as in those who may wish to devote themselves to bedside nursing; appreciation of the fact that hospital authorities are on the alert to find girls who will ultimately be fit and willing to undertake the higher administrative posts would have great recruiting value.

A more genial reception of a candidate's preliminary overtures for admission as a probationer would probably have a favourable effect on recruiting. As matters now stand, candidates may be kept waiting for months before they know whether their application has been approved of or not. They are then faced with the need to sign a contract which is drawn up on the most severe and stern rules, lists of penalties which may be inflicted, and possibilities of dismissal, so that the young applicant, instead of feeling that she is being welcomed as a colleague, feels that she is entering what is almost a cloister. The Commission recommend a drastic revision of these contract forms; they advise that, whilst a Matron should have the right to suspend a nurse, the right of dismissal should rest with a committee before which the nurse can state her case.

Accommodation for nurses appears to be unsatisfactory in many hospitals, though great improvements have taken place in this matter of recent years. The Commission remark that difficulty in raising money is no excuse for enlarging a hospital without providing proper accommodation for the extra nursing staff required.

Hospital food, whilst usually adequate in quality and quantity, has a reputation for monotony, careless preparation, and unappetizing service. In large institutions economy as well as improvement could be effected by employing an expert to supervise the catering and cooking. At least 40 minutes should be allowed for the midday dinner. Compulsory attendance at meals adjacent to off-time duty is a restriction which is keenly felt, and which should be rescinded; if a nurse is out with friends in her off-duty time she may like to remain with them for a meal instead of having to return to hospital for it.

With regard to discipline, although great changes have been made of recent years in hospitals, yet they have not kept pace with the changes in personal freedom accorded to young women elsewhere. The complaint is made that in no other occupation is the same degree of supervision thought necessary outside working hours. In the nurses' home, it is said, the restrictions are based less on the

convenience of the community than on a traditional theory of discipline. A more friendly atmosphere should be cultivated in the home, which should be run as a hostel under a warden. Compulsory bed-time at 10-30 p.m. is early enough for probationers, and 'lights out' half an hour later need not be insisted on. Inspection of cupboards and drawers in bedrooms is inconsistent with the modern girl's idea of privacy. The present-day nurse is often an inveterate cigarette smoker, and smoking should not be unduly restricted. Simplification of uniform is a matter which should be taken up; soft collars and cuffs are more comfortable than starched ones, and overalls are a welcome innovation in many hospitals.

The Commission see no reason why a proportion of the trained nurses in any hospital should not live out.

A serious grievance complained of in half the hospitals consulted is that the nurse does not know her off-duty hours until the morning of the same day; this should be remedied by giving at least a full week's notice of free hours. Telephone facilities should be granted to nurses, and reception rooms should be available for guests. Staff nurses should be given complete discretion in going out and coming in during off-duty hours, and should be at liberty to attend meals or miss them at will; an occasional week end off duty and four week's holiday a year are recommended; whilst the nurse should be able to invite guests to meals on giving due notice and on appropriate payment. The ward sister should have a sitting room as well as a bedroom, and her staff should be sufficient to make it unnecessary for her to give up her off-duty time to help with routine work except in real emergencies.

There is room for a more sympathetic attitude towards the nurse's natural desire not to cut herself off completely from her former social life. The modern girl refuses to admit that it is justifiable to regulate her private life in order to ensure her efficiency as an employee. Regulations forbidding nurses to go out between 8 and 10 p.m. without special permission are an interesting survival of former days and a potent source of discontent. The Commission does not go so far as to recommend 'every nurse her own latchkey' as a slogan, but they consider that during the hours between 8 and 10 p.m., if the probationer or nurse is off duty, she should be free to go and return as she likes.

The question of hours of work is a very thorny one. In different hospitals the span of duty varied from 11½ to 14½ hours (excluding off hours during a spell of duty). The Commission conclude that up to a point shortening of hours is likely to increase efficiency. They do not advocate legal enforcement of an 8-hour day, as they consider this impossible owing to hospital emergencies and necessities.

They recommend, however, that the daily span of work should not exceed 13 hours, including at least 1½ hours for meals and 3 clear hours off duty. One completely free day should be allowed each week, and not less than 3 weeks' holiday a year for probationers, with more for trained nurses. Corresponding proposals are made for night duty; one free night should be provided every week irrespective of three-monthly breaks. No nurse, except a night sister engaged as a permanent officer, should be kept on night duty for more than three months in any year.

Many probationers find it hard to learn new subjects after working in the wards from 7 a.m. to 8 p.m., with 2 or 3 hours off duty (when they are urged to be out of doors). The Commission recommend that Part I of the Preliminary State examination of the General Nursing Council—anatomy, physiology, and hygiene—should be taken as a rule before the nurse enters the wards, or better still, that under a system of scholarships or maintenance grants it may be taken before the probationer enters hospital. Exemption should be granted in those subjects in which a candidate already holds a university degree or has passed a high examination. Some of the theoretical work should be dispensed with, and the examinations simplified. A particularly important point (and one with which we are in full sympathy) is that teachers and examiners should recognize that the candidate is training for the nursing, and not for the medical, profession. Only too often lecturers in anatomy give nurses detailed lectures which are suitable only for medical students; a nurse should know where the appendix vermiformis is and that it is liable to disease, but it is unreasonable to expect her to know its blood, lymph, and nerve supply. To ask a nurse to write an essay detailing the causes of blindness and their prevention is demanding a standard to which even few medical students could attain. The Commission found that not infrequently a candidate would have been up all night on night duty just before the day of her examination, and recommend that in all instances the candidate should be granted a complete 24 hours off duty on the day before an examination. The regulations which forbid hospitals from making any allowance for time previously spent in other training schools should be modified.

One of the chief causes of shortage of nurses is that many girls or their parents believe that a nurse's training involves unduly severe and prolonged physical strain. In this matter, however, there has been great improvement of recent years; sweeping, brass-cleaning, furniture polishing and all similar purely domestic duties should not be part of a nurse's duty, but should be carried out by ward-maids. The Commission found that often a first-year student spends 2½ hours daily in this way, and

they recommend that enough ward-maids should be provided to relieve nurses of domestic duties not directly concerned with the patients. Further, it is not justifiable to enlist more probationers for training than the nursing profession can absorb, merely in order to provide the hospitals with student labour. Only hospitals which can provide adequate experience should be recognized as training schools; other hospitals should be staffed with trained nurses and domestic workers.

With regard to pay, hospitals at present tend to raise probationers' pay in the hope of getting more recruits. But responsible parents attach less importance to cost of training than to future security. A high initial rate of pay may encourage inferior entrants, but a better policy is to give low salaries to probationers and increase those of the trained staff. Popular hospitals might offer no salary at first but allow study-leave and six weeks' holiday a year, providing scholarships where necessary.

In big hospitals, appointment as staff nurse (second in command of a ward) should provide useful post-graduate experience, and the Commission find that the present scale of pay is not inadequate. Extra inducements should be offered to staff nurses in small, outlying or special hospitals and sanatoriums. The Commission are of the opinion that, considering their responsibilities, ward sisters as a rule are underpaid.

The prospect of district nursing and public health work would attract more girls to the profession if remuneration were a little better. But higher fees for private nursing would lead to less demand and hence to unemployment.

Finally, a scheme is outlined for correlating the pension schemes of voluntary and municipal hospitals.

Special sections of the report deal with tuberculosis and mental hospitals. Tuberculosis hospitals suffer from peculiar difficulties in competing with other hospitals for sisters, staff nurses, and probationers. The training is not approved for State registration, the work is monotonous and uneventful, and the fear of infection makes parents reluctant to allow their daughters to take up this branch of nursing. Here the Commission recommend that in the Supplementary Register, containing the names of nurses trained in the nursing of persons suffering from infectious diseases, a special section should be included in which should be placed the names of nurses trained in the nursing of patients suffering from tuberculosis. They also recommend that higher pay, greater amenities, and longer holidays should be offered in connection with work in sanatoriums.

With regard to nursing in mental hospitals, the Commission state that the difficulties peculiar to mental hospitals include:—the nature of the work; the fact that in any mental hospital the types of patient to be nursed and the

kind of nursing required are very diverse; the lack of facilities for double training (mental and nursing) in a reasonably short time; the existence of two distinct recognized qualifications for mental nurses; and the presence in some mental hospitals of a proportion of 'drifters'—nurses who are not serious workers. Here the Commission recommend the filling of ward sisters' and higher posts by nurses who have had a general as well as a mental training. Greater facilities for fully-trained mental nurses to take out a two-years' course in general hospitals are urgently required. The provision of teaching and accommodation for study should be adequate, and probationers should be encouraged to undergo progressive training. Hospitals which have sought and obtained approval by the General Nursing Council as training schools should provide teaching for the State examinations. Special care should be taken that young, inexperienced probationers do not begin their work in wards where the patients are likely to be abusive, noisy or violent. The stretch of work during which no meal is provided should never be as long as 7 hours. Advertisements should show clearly what is the net salary offered at the time of appointment, and nurses in hospital should be furnished on pay-days with a statement showing the gross amount due to them and the deductions which have been made.

* * * *

It will be seen from the above review how comprehensive and detailed are the recommendations made by the Commission. The report might well be termed the nurses' Magna Charta. Once again, the *Lancet* has come forward with a notable advance in medical policy. On a study of the recommendations, it does not seem that anything in the way of State legislation is called for; on the other hand the gradual introduction of the reforms recommended by the boards of management of hospitals throughout Great Britain should go far to raise the status of the nursing profession and to make for the greater contentment, happiness and efficiency of a band of magnificent workers.

Conditions in India differ widely from those in Great Britain. The term 'nurse' with regard to the big hospitals in India includes British nursing sisters, staff nurses, trained nurses and probationers who may be training for a high standard, or for the junior certificate, or even simply taking a training without any examination in view. We do not propose here to deal with such organizations as the Queen Alexandra's Military Nursing Service or the Lady Minto Nursing Association, but with the staffing of the large civil hospitals. The nurse in India is relieved of a considerable part of the menial and domestic duties which the nurse in Great Britain has to undertake, as there are provided ward bearers, ward coolies, sweepers, and other menials. On the other hand, with

the exception of a few favoured hill stations, she has to contend with the climate. And over everything broods the dire poverty of financial resources in the provinces. It is not so much want of nurses as want of funds that is India's chief difficulty; in fact it is only in the big hospitals of the presidency towns and larger cities of India that nurses can be employed.

We have asked Lieut.-Col. A. H. Proctor, D.S.O., M.D., F.R.C.S.E., I.M.S. for several years Surgeon Superintendent, Presidency General Hospital, Calcutta, and now Acting Professor of Surgery, Medical College, Calcutta, for notes on conditions in India, as he has always taken a great interest in the subject of nursing in India; and the following is a summary of his remarks.

'It is useless to provide hospitals and doctors for the sick unless an adequate nursing service can be assured', quotes Col. Proctor from the *Lancet* Commission's report. And from the *Bulletin of the American Hospital Association* on 'the ratio of hospital personnel to patients' he takes the following example. 'The more complete, thorough and scientific service a hospital renders, the higher will be the ratio of personnel to patients. This is well illustrated in comparing two hospitals in a city of 88,000 population. These two hospitals were equally well equipped, had the same staff of doctors, and the same class of patients. In one institution where the nursing personnel was 1 nurse to 6 patients, the post-operative mortality was 5.5 per cent., whereas in the other hospital, where there was 1 nurse to 1½ patients the post-operative mortality was 1.8 per cent. This variation in results was attributed by the medical staff and management particularly to the difference in the ratio of nursing personnel'.

What is an 'adequate nursing service'? A most interesting report on this subject has been published by a sub-committee on nursing of the International Hospital Congress. Thirty-eight countries were represented, including India, and the nursing conditions in some twenty-five countries accurately described. From this and from the *Lancet* Commission's report, we extract the following statements:—

(i) Of the London voluntary hospitals 10 per cent. have a ratio of one nurse per bed, and 90 per cent. a ratio of one nurse for two beds.

(ii) Numbers of staff per 100 patients in surgical wards in different countries:—

	Nurses.	Orderlies.	Maids and cleaners.
Egypt	49.9	2.6	21.1
Syria	62.5	18.8	6.3
Bulgaria	46.5	..	5.0
Japan	46.49	..	..
Korea	23.26	..	..

(iii) In an American enquiry as to conditions in 1,196 approved hospitals the ratio of nurses to patients was found to be 0.62, or two

nurses for every three patients. For hospitals with a bed capacity of 250 to 499 beds the average ratio was 0.54 or one nurse to every two patients.

The conclusion which we draw from these figures is that 'adequate nursing' demands approximately a strength of one nurse to every two beds.

We can approach this question from another angle, and if we turn to time studies as to nursing care, we find the following figures:—

Daily average time of nursing care for cases during their stay in hospital:—

Appendicitis	..	160 minutes.
Fracture of the femur	..	128 minutes.
Tonsils and adenoids	..	187 minutes.
Total	..	475 minutes, or roughly 8 hours.

so that 100 surgical cases would require 34 nurses on 8-hour duties. To this we have to add an allowance of 10 per cent. for domestic and administrative duties, and also approximately one sister for each 25 beds—a total of 41.4 nurses per 100 surgical beds. These figures, if we make further allowances for the administrative staff, out-patient departments, operating theatre, isolation and special wards, *plus* reserves for leave and sickness, require certainly not less than one nurse to every two beds.

Where does India stand in regard to nursing care of patients in her hospitals? We may restrict our remarks to hospitals which are attached to medical colleges and schools, always bearing in mind that adequate nursing is essential to the conduct and teaching of present-day medicine and surgery. An adequate nursing service is one nurse to every two beds. The following are the figures for the Indian provinces:—

Province.	Number of nurses.	Number of beds.	Ratio; beds per nurse.
Burma	.. 136	540	4
Bihar and Orissa	.. 46	492	10.7
United Provinces	.. 38	300	8
Bengal	.. 132	675	5
Madras	.. 135	540	4
Bombay	.. 176	582	3.3

These figures are for six of the best nursed general hospitals in India. Not a single hospital has a nursing staff comparable with that of a London voluntary hospital.

In 1928 there were 847 nurses under training in Indian hospitals. If we estimate another 420 as trained nurses, we get a total of 1,267 nurses engaged to nurse a grand total of 59,147 beds; or a ratio of one nurse to 46 beds. It is of course common knowledge that a large number of hospitals have no nurses, and the majority one or two only.

Outside presidency towns and the capitals of provinces nursing is non-existent. Even in

presidency towns nursing may be quite inadequate; as an example may be quoted at the present moment one hospital of 88 beds devoted to surgery alone; this has a staff of six nurses on day duty and two nurses on night duty. It is a modern hospital of eight wards, each of 10 beds, *plus* 8 private rooms, is associated with a medical college, and maintained by the State.

The real tragedy, however, is that we are educating in these miserably-staffed institutions young and energetic medical students to regard this as a normal standard of efficiency. Every medical student looks on his training school as setting the standard which he is expected to live up to in after-life. At least our training schools for doctors should live up to 1932 standards; we should not have to go back 75 years to find comparable conditions in other countries of the world. India should at least bear comparison with Egypt, Syria, Korea and Japan. Figures are not available, but we are informed that the Malay States, Singapore, Hong Kong and Shanghai are all far ahead of any hospital in India in this respect.

On figures alone, our Indian hospitals have inadequate staffs. We need not enter into the question of standards of education and training of the nurses.

* * * *

Colonel Proctor's figures are sufficiently convincing. Yet, even so, many a grateful patient realizes that he owes his life to careful nursing in one or other of the big hospitals in India. Hampered by want of funds and very badly hit by the present economic depression, the Calcutta Nursing Institution does splendid work in that city. Yet it is clear that if a new India is to have the hospitals that it really requires, the problem of nursing staff for the big hospitals will have to be seriously considered.

Medical News

THE FACULTY OF TROPICAL MEDICINE, BENGAL

At the examination for the Diploma of Tropical Medicine (D.T.M. Bengal), held at the Calcutta School of Tropical Medicine in April 1932, the following 31 out of 38 candidates were successful.

Passed with distinction

1. Das Gupta, Chittaranjan, M.B. (Cal.), (Clinical Assistant, Kala-azar Inquiry under the Indian Research Fund Association, School of Tropical Medicine and Hygiene, Calcutta). Awarded the 'Chuni Lal Bose' Gold Medal, 1932.

Passed

(In alphabetical order)

2. Acharyya, Ram Chandra, L.M.F. (Bengal), private practitioner.
3. Basu, Bholanath, M.B. (Cal.), D.P.H. (Cal.), private practitioner.

4. Basu, Nirmal Chandra, M.B. (Cal.), D.P.H. (Cal.), private practitioner.
5. Chanda, Surendra Kumar, M.B. (Cal.), D.P.H. (Cal.), Health Officer, South Suburban Municipality, Behala, South Calcutta.
6. Chandra, Gopal, L.M.P. (Agra), I.M.D., Sub-Assistant Surgeon, Government of India.
7. Chattapadhyay, Balai Chand, M.B. (Cal.), D.P.H. (Cal.), private practitioner.
8. Daengsvang, Svasti, Diploma of Medicine (Chulalongkorn University), C.P.H. & Dr. of Public Health (Johns Hopkins University), Instructor in Chulalongkorn University.
9. Dhondy, Byram Sorabji, M.B., B.S. (Bom.), Major, Indian Medical Service (on furlough).
10. Fernandez, Eric Cyril, Diploma of the Board of Examiners, Medical College, Madras, I.M.D., Assistant Surgeon, Government of India.
11. Ganguli, Amal Chandra, M.B. (Cal.), D.P.H. (Cal.), private practitioner.
12. Ghosh, Kiranbihari, M.B. (Cal.), private practitioner. (Awarded the first prize in entomology).
13. Ghosh, Sachindra Nath, M.B. (Cal.), private practitioner.
14. Gupta, Suprakash, M.B. (Cal.), private practitioner.
15. Misra, Kashinath, M.B. (Cal.), Civil Assistant Surgeon, Government of Bihar and Orissa.
16. Ogden, John Lionel, D.G.M.C. (Bom.), I.M.F. (Bengal), I.M.D., Assistant Surgeon, Government of India.
17. Rai, Jaswant, L.S.M.F. (Agra), I.M.D., Sub-Assistant Surgeon, Government of India.
18. Rao, Sangli Raghavender, L.M. & S. (Hyderabad), Assistant to the Special Plague Officer, Hyderabad, Deccan.
19. Sah, Prem Lal, L.M.P. (Agra), private practitioner.
20. Saha, Charu Chandra, M.B. (Cal.), private practitioner.
21. Sarma, Kishorilal, L.M.F. (Bengal), L.T.M. (Bengal), Medical Officer, Ward Health Association, Calcutta Corporation, Calcutta.
22. Sen, Joyanta Kumar, M.B. (Cal.), private practitioner.
23. Sen, Priyabrata, L.M.F. (Bengal), Medical Officer in-charge of Jaleswar Dispensary under the District Board of Balasore, Orissa.
24. Sen Gupta, Harshanath, L.M.P. (Dacca), Sub-Assistant Surgeon, Government of Bengal.
25. Sen Gupta, Kali Kinkar, M.B. (Cal.), private practitioner.
26. Soni, Govinda Ram, L.M.P. (Central India), L.T.M. (Bengal), Medical Department, Jodhpur State.
27. Syed Ali, Imam, M.B. (Cal.), Civil Assistant Surgeon, Government of Bihar and Orissa.
28. Vepthula, Chumlong, M.B., B.S. (Hongkong University), Medical Registrar, The King Chulalongkorn Memorial Hospital, Bangkok.
29. Vyas, Saligram Benimadho, L.M.P. (Agra), I.M.D., Sub-Assistant Surgeon, Government of India.
30. White, Wilfred Ian, Diploma of the Board of Examiners, Medical College, Madras, I.M.D., Assistant Surgeon, Government of India.
31. Woodhouse, Edward Beaumont, L.S.M.F. (Bengal), I.M.D., Assistant Surgeon, Government of India.

BOMBAY MEDICAL COUNCIL

THE following summary of the proceedings of the meeting of the Bombay Medical Council held on the 22nd February, 1932, is published for information:—

(1) Dr. Jivraj N. Mehta, M.D. (Lond.), M.R.C.P. (Lond.), etc., was introduced by the President as a new member.

(2) The Council considered a letter from Mr. G. K. Deshpande to the effect that the qualification of M.D. of Berlin University which he possesses may be held to be one entitling the holder to primary registration under

the Bombay Medical Act. The Council resolved to obtain further information regarding the course of studies of the M.D. of Berlin University and to postpone consideration of the question pending receipt of such information.

(3) The Council considered an application from the Mysore Government for the recognition of the degree of M.B.B.S. of the Mysore University as a qualification registrable under the Bombay Medical Act, and resolved that steps be taken to move the Bombay Government to add the qualification in question to the schedule of the Act.

(4) The Council considered an application from the Mysore Government for the acceptance of the diploma of L.M.P. of the Mysore Medical School for registration under the Bombay Medical Act, the said School having been merged into the Mysore University. The Council resolved to recommend to the Bombay Government that their previous Notification adding the L.M.P. of the Mysore University to the schedule of the Act be so modified as to include the L.M.P. diploma of the Mysore Medical School.

(5) The following six members were elected by ballot as members of the Executive Committee:—

Sir Nasarvanji Choksy.

Dr. Dinshah M. Gagrati.

Sir Temulji Nariman.

Dr. Rajabally Patel.

Rao Bahadur Captain N. H. Kulkarni.

Dr. Jivraj N. Mehta.

(6) The Council resolved to move Government to alter rule 70 so as to permit of the Executive Committee instituting enquiries into any declaration made thereunder.

Current Topics

The Serum Therapy of Plague

By B. P. B. NAIDU, M.D. (Edin.), M.H., D.P.H.
D.T.M. (Liverp.)

and

F. P. MACKIE, K.H.S., O.B.E., M.D., M.Sc., D.P.H. (Brist.)
F.R.C.S. (Eng.), F.R.C.P. (Lond.)
BREVET-COLONEL, I.M.S.

(Abstracted from the *Lancet*, Vol. CCXXI,
October 24th, 1931, p. 893)

ALTHOUGH bubonic plague has been raging in India for nearly 35 years, its treatment has hitherto remained symptomatic. It is true that a considerable measure of success has attended the prevention of the disease by the use of Haffkine's prophylactic, but attempts, whether in India or elsewhere, to produce a curative serum have hitherto been disappointing. That great desideratum, a bactericidal drug which shall effect sterilization by intravenous medication, has been sought assiduously, but not found. Work on these lines has been carried on in the Haffkine Institute, and a number of substances—particularly of the mercuri-phenol group—have been synthesized by Caius and others of this laboratory, but even when they have been found *in vitro* to possess very high bactericidal action on *B. pestis* this action has not been found transferable to the living animal.

Haffkine's vaccine, whether plain or sensitized, has likewise been found to be ineffective once the course of the disease has started. The successful results recorded by d'Herelle in Alexandria in 1925, following the use of his anti-pest bacteriophage, raised great hopes, but when this remedy was subjected to a careful trial in India it proved ineffective and did not influence either the course of the disease or the case-mortality. Successful results have been recorded from the use of plague serum outside India, but when this method has been used in Indian hospitals the results have not been

so satisfactory. Whether this is due to the greater virulence of *B. pestis* in India or to some other factor is not clear, but d'Herelle, in his work on plague-phage, found that strains of *B. pestis* isolated in India were much more virulent than those from other sources.

A careful analysis of the results obtained by the use of various preparations of sera in our hospitals during the years 1897-1912 showed that their administration was attended by a reduction in case-mortality of not more than 7 to 10 per cent. The Advisory Committee on Plague Investigations in India reported in 1913 that, as a result of an inquiry into the matter, 'the administration of the available sera is not a practical means of bringing about any material diminution in the mortality from plague; it may well be that better results will be obtained if the treatment could be commenced within a few hours of the onset of the disease; this, however, is in the great majority of cases impossible in ordinary hospital practice'. The figures relating to these trials are given in table I.

Choksy (1923), of Bombay, who has had unrivalled experience of the treatment of plague in India, found a moderate reduction of 10 to 20 per cent. in case-mortality from the use of anti-pest serum, and urged further research regarding its manufacture, on the ground that 'it is the only remedy that holds out any hope of reducing the excessively high case-mortality which has so markedly characterized the epidemics at Bombay'.

In 1927 a fresh attempt was made at the Haffkine Institute to approach this problem, and one of us (B. P. B. N.) was put on special duty under the auspices of the Indian Research Fund Association to carry out the investigation. Our previous work on plague vaccines showed us that the first necessity is to use the most virulent strains of *B. pestis* available, and to see that they retain their high degree of virulence throughout the process of vaccine manufacture. These requirements we summarized as follows: (1) the immunizing value of a vaccine is largely dependent on the virulence of the strain employed for its preparation; (2) strains isolated either from human cases or from experimentally infected rats exhibit individual variations in virulence; (3) emulsions made from plague-infected spleen are more virulent than those obtained from cultures on agar or in broth; (4) virulence of the strain is lost wholly or in part under prolonged cultivation on artificial media; (5) virulence of the organism is modified by passages from a highly susceptible animal into animals of relatively low susceptibility; and (6) an avirulent strain produces a vaccine of low potency.

The next desideratum in the production of serum is the choice of an animal which is naturally susceptible to the pasteurilla group of organisms or which is readily susceptible to *B. pestis* by inoculation. Hitherto the horse has been the animal of choice, and the anti-plague sera of Yersin, Roux, Kolle, Lustig, and others were made from this animal. Haffkine (quoted by Bannerman, 1905) found that sheep produced a better serum than horses, whilst Terni (quoted by Bannerman) in Messina produced a more potent serum from mules and cattle than from horses. To what extent the susceptibility of an animal to infection by a particular organism influences the production of a potent serum is a subject which seems to have received little attention, but we decided to discard the horse and to attempt the production of serum from bovines and sheep, on the ground that they are animals naturally liable to pasteurilla infection.

For convenience, we first used rabbits, which are highly susceptible to plague and to other pasteurilla infection by laboratory methods, and we were able to immunize these animals to a point when they would withstand a dose of one agar slope a week of living virulent plague bacilli by intravenous injection over a period of two years. Incidentally, we found that immunization by the subcutaneous route produced a lower grade serum than by the intravenous route. Serum from these immunized rabbits was then used

as a curative measure in other plague-infected rabbits. The serum was administered in quantities not exceeding 2 c.cm., either as a single dose or in similar amounts at intervals of 24 hours, with the results shown in table I.

TABLE I

Time of administration of serum after infection	Infected rabbits	Mortality within 30 days after infection, per cent.
Immediately after ..	34	0
24 hours ..	40	0
48 " ..	43	9.3
72 " ..	48	31.2
96 " ..	25	32.0
Controls ..	33	94.0

From this it will be seen that all the animals were cured when the serum was given up to 24 hours after infection, and even when treatment was delayed until 96 hours after infection, when the animals are severely ill or even moribund, the serum saved two-thirds of the rabbits as compared with the controls. This experiment showed us that it was possible to manufacture an anti-plague serum of high curative value in animals of the same species, and the next thing to attempt was to produce serum from a large animal which would act similarly on those of a different kind.

Sheep were then tried, and were found to be very susceptible to plague. We inoculated 12 sheep with intravenous doses of virulent *B. pestis* varying from 0.003 mg. to 0.018 mg. of spleen substance of a rat which had died of plague. Six of the sheep died, five within 11 days of infection, with signs of acute plague. We now began the immunization of sheep, using virulent cultures intravenously in graduated doses at weekly intervals, working up from 1/20th of an agar slope to 50 agar slopes at a dose. In the course of this very severe test most of the sheep died, and at the end of 16 months only three remained out of the original 21 animals. This sheep serum was then tested for its curative properties, side by side with the anti-plague serum of the Pasteur Institute at Paris, on a batch of 800 infected Madras rats. The results are seen in table II.

TABLE II

Time of administration of serum after infection	Dose in c.cm.	SHEEP SERUM		PASTEUR INSTITUTE SERUM		CONTROLS	
		Rats	Mort. %	Rats	Mort. %	Rats	Mort. %
Immediately after	1	100	13.0	100	52.0	85	88.2
24 hours after ..	1	100	43.0	100	83.0	100	90.0
	2	100	23.0	100	72.0	100	91.0
	3	100	32.0	100	77.0	100	97.0
TOTAL ..		400	27.7	400	71.0	385	91.7

The results show that sheep serum is about two and a half times as potent as the Pasteur Institute serum, and saves the lives of about two-thirds of the infected rats, even when its administration is delayed for 24 hours.

Owing to the heavy mortality amongst sheep and their relatively small yield of serum, we next turned our attention to calves. We began with two eighteen-months-old calves weighing each about 300 lb. and injected them with living virulent plague cultures by the intravenous and subcutaneous routes. The latter gave too severe local and general reactions, so subsequently the intravenous route was used. As in one calf the dose was too rapidly increased (it died after the seventh injection when 40 agar slopes were given in a single dose), the other calf received more gradual

doses, and it survived. It was bled at the end of 12 months when it had received 38 intravenous injections, beginning with one-fifth of an agar slope and ending with 100 slopes at a dose. The therapeutic value of its serum was then tested on 250 rabbits and 40 controls, side by side with the anti-plague serum of the Pasteur Institute of Paris. The results are shown in table III.

TABLE III

Time of administration of serum after infection	CALF SERUM		PASTEUR INSTITUTE SERUM		CONTROLS	
	Rabbits	Mort. %	Rabbits	Mort. %	Rabbits	Mort. %
48 hr. after, 1 c.cm. on 3 suc. days.	50	18.0	50	52.0	10	100.0
72 hr. after, 2 c.cm. on 3 suc. days.	50	24.0	50	64.0	10	100.0
72 hr. after, 1 c.cm. once.	25	24.0	—	—	10	100.0
72 hr. after, 2 c.cm. once.	25	16.0	—	—	10	100.0
TOTAL ..	150	20.7	100	58.0	40	100.0

suc. = successive.

We regarded these results as very promising, in that our serum saved 80 per cent. of rabbits compared with the controls, and that such a small dose as 2 c.cm. saved over 80 per cent. of rabbits in which the infection had remained unchecked for 72 hours. The Haffkine Institute serum was nearly three times as potent as that prepared by the Pasteur Institute of Paris.

At this stage, acting on a suggestion of Dr. G. F. Petrie, of the Lister Institute, we carried out a comparative test on the value of their serum with the Haffkine Institute and other anti-plague sera. This experiment involved the use of 1,768 Madras rats. The results are seen in table IV.

TABLE IV

Sera tested	PROTECTIVE VALUE	ANTITOXIC VALUE	CURATIVE VALUE
	Rats used—		
	560	650	558
Mortality, per cent.			
Unconcentrated, Lister Institute—			
‘Armistice’ ..	100.0	43.0	93.0
‘Rowland’ ..	29.0	30.0	39.0
Pasteur Institute ..	70.0	52.0	65.0
Haffkine Institute—			
Sheep ..	0	0	3.3
Calf ..	10.0	0	5.0
Normal horse ..	97.0	90.0	93.0
Concentrated—			
German ‘A’ ..	42.5	—	77.5
German ‘B’ ..	45.0	—	65.0
‘Rowland’ ..	20.0	—	37.5
Reconcentrated—			
‘Rowland’ ..	15.0	—	81.6
Controls ..	97.5	95.0	92.5

These results showed that the Haffkine Institute sera had much greater protective, antitoxic, and curative value than any of the other sera. The reconcentration of the Lister Institute serum ‘Rowland’ appears to lessen its curative property very considerably.

AGGLUTINATION AND PRECIPITATION TESTS

The normal sera of sheep, calves, and horses do not agglutinate the plague bacillus. The immune serum from sheep agglutinates living plague bacilli in a dilution of 1 in 64, that from calf in a dilution of 1 in 256, while that from the horse obtained from the Pasteur Institute and the Lister Institute fails to agglutinate these bacilli even in a dilution of 1 in 2. Experiments carried out with the filtrate of a six weeks’ broth culture of *B. pestis* showed the presence of precipitins in the

sera of immunized sheep and calves. These precipitins were absent from the anti-plague sera obtained from the Pasteur Institute and the Lister Institute, and also from normal sera of sheep, calves, and horses. Thus the anti-plague sera of the Pasteur Institute and the Lister Institute contain neither agglutinins nor precipitins for our local strains.

With this preliminary work as our guide, we were ready to undertake the crucial experiment on the attempted cure of human plague. By February 1931, we had five sheep, three bullocks, and four buffaloes fully immunized. They had received 35 to 45 injections during the preceding 12 months, having reached a final dose of 100 agar slopes at each infection in the case of sheep and 200 slopes for buffaloes and bullocks. Before using the serum for human cases we carried out a short experiment to ensure the stability of the stored serum. Rabbits were given a dose of 1 c.cm. on three consecutive days, 48 hours after the infecting doses of *B. pestis*. The results were:—

Bullock serum ..	11 rabbits ..	mort. % 18.0
Buffalo serum ..	18 ” ..	” 11.1
Controls ..	8 ” ..	” 100.0

These results satisfied us regarding the retention of potency.

USE OF THE SERUM IN HUMAN PLAGUE

An outbreak of plague at Hyderabad (Deccan) furnished an opportunity to try the effect of our serum on human cases. By the kindness of Colonel Norman Walker, I.M.S., and the staff of the Plague Hospital, we were able to carry out some observations on scientific lines. At first every alternate case admitted to the hospital was given serum and the control case treated with all other usual therapeutic measures except serum. Later, every third admission was taken as a control for, as the efficacy of the treatment became apparent, much pressure was brought to bear on us to abandon the use of controls, and medical men refused to send cases unless serum treatment was guaranteed. We were able to observe the course of the disease in 76 cases which could be divided into three classes: (a) cases with heavy *B. pestis* septicæmia; (b) cases with light septicæmia or pure bubonic cases; and (c) cases diagnosed clinically as plague but not bacteriologically confirmed.

Of the 76 cases, 43 were treated with serum, with 15 deaths, and 33 controls without serum, of which 23 died. Table V shows the disposition of the cases.

TABLE V

Class	CULTURAL DIAGNOSIS		UNDER SERUM TREATMENT		CONTROLS (WITHOUT SERUM)	
	Bubo	Blood	Cases	Deaths	Cases	Deaths
A {	+	+++	10	7	8	8
	+	+++	1	1	3	3
	+	++	3	2	4	4
	—	++	1	1	2	2
Total ..			15	11 (73.3%)	17	17 (100.0%)
B {	+	+	7	1	3	2
	+	+	1	0	1	1
	+	—	11	3	4	1
Total ..			19	4 (21.0%)	8	4 (50.0%)
C {	Clinically plague, not bacteriologically confirmed.		9	0	8	2 (25.0%)

+ = less than 10 colonies in 0.25 c.cm. of blood.
++ = less than 100
+++ = 100 colonies and over ” ” ”

Regarding class A, the septicæmic class, it has always been held that the presence of any considerable number of *B. pestis* in the circulating blood was the

invariable presage of death. A reference to table VI will reveal that all previous experience in India shows that such cases gave 100 per cent. mortality, and our 17 control cases all died, whereas four out of 15 recovered under serum treatment. Apart from recovery, some striking bacteriological observations were made on cases which ultimately succumbed, in that the septicaemia was observed to lessen or to disappear entirely under serum treatment, whereas in cases which received no serum septicaemia, once established, increased up till the time of death. Death in the former group of cases was attributable to myocarditis or other toxic manifestations resulting from the previous septicaemia.

Class B, which includes the cases of moderate severity, also yielded interesting information, though the numbers are very small. It is in this class that we should expect to save the largest percentage by serum treatment. It includes the early or slight septicaemic cases (those with less than ten *B. pestis* in a quarter of a c.cm. of blood) and the bubonic cases without generalized infection at the time of examination. The factor responsible for death or recovery in plague is probably septicaemia and, if the infection remains localized either naturally or as a result of serum therapy, the recovery of the patient may be expected. We believe that the prompt administration of serum will prevent this blood infection and, as we have shown, may sterilize the blood even when early septicaemia has occurred. Thus in the small group of eight cases with early septicaemia, seven recovered under serum treatment, whereas only one out of four recovered without serum. The relationship of septicaemia to recovery under serum therapy is set out in table VI.

TABLE VI

SEPTICAEMIC CASES IN HOSPITAL ADMISSIONS		BERESTNEFF AND MAYR, BOMBAY, 1901. LUSTIG'S SERUM				PLAGUE COMMISSION, BOMBAY, 1908-12. SERA OF PASTEUR INST. AND OF LISTER INST.			
Class	Cultural diagnosis of blood	Tr.	Mort. %	Cl.	Mort. %	Tr.	Mort. %	Cl.	Mort. %
A	++++	6	100.0	9	100.0	75	100.0	81	100.0
		9	100.0	5	100.0	15	100.0	24	100.0
B	+	28	78.6	9	77.7	47	74.5	47	74.5
B+C	0	28	71.4	10	50.0	85	25.9	70	34.3

See note under Table V. Tr. = treated; Cl. = control.

These results show that in former experiments carried out in India three out of every four cases died with the mildest or earliest degree of blood infection, whilst of those which have had more than 40 *B. pestis* per c.cm. of blood every case has died.

Class C included 17 cases of undoubted plague from which *B. pestis* was not recovered; all nine cases treated with serum survived, whilst two out of eight control cases died.

We began by giving doses of 100 c.cm. of serum, but we very soon found that this large amount of protein, when injected intravenously in one dose, was sufficient to embarrass if not to endanger the heart already poisoned by plague toxins. The fact that two cases in class B died within two hours of injection suggests that these large doses may have precipitated the fatal result. Subsequently the dose was reduced to 60 c.cm. on admission, with a further dose of 40 c.cm. on the next day. In three cases repeated doses had to be given for several days, and it appears that if this practice could always be carried out more cases might be saved. From the clinical point of view the improvement of some cases under serum treatment was remarkable, the fever going down, eyes becoming clear, delirium disappearing, and the heart improving in tone within a few hours of the administration of the serum.

REMARKS

In this paper we have endeavoured to give a brief account of the laboratory work which led up to the use of this anti-plague serum on human cases and, whilst the former shows conclusively that a potent serum has been produced, the human experiment, though very favourable, is inconclusive, in that the numbers were too small to carry statistical weight. The fact that the plague season in India has ended for the time being, and the removal of one of us (F. P. M.) to another sphere of duty, decided us to publish these results in the form of a preliminary report.

It may be argued that, as the epidemic was on the decline, our results were thereby vitiated, but the force of that argument is lessened in that we compared our cases with controls admitted alternately to the plague wards, and the careful observations on septicaemia in themselves provided a still more accurate standard of comparison. The paucity of cases was unavoidable, and though we made every effort to extend the range of observation during the plague season just past we were unable to find any area where a sufficient number of cases could be got together under conditions suitable for a more conclusive scientific experiment.

CONCLUSIONS

(1) It has been found possible to produce a more potent anti-plague serum than any that has hitherto been available. In preparing this, attention was paid to three points which are considered to be of importance—namely, the choice of the animal, the virulence of the strain used, and the method of immunization.

(2) Cattle were chosen rather than horses, on the ground that they are naturally susceptible to organisms of the *pasteurella* group.

(3) A highly virulent strain of *B. pestis* was used in the production of serum.

(4) The serum of immunized cattle was found to possess good agglutinative power and to be possessed of antitoxic as well as antibacterial properties.

(5) The use of this serum as a curative measure resulted in the saving of the lives of a high proportion of rats and rabbits as compared with the controls.

(6) In all these desirable properties the Haffkine Institute serum was shown to be far superior to any other anti-plague serum tested.

(7) When applied to a small human epidemic the results were very promising. Out of a total of 76 cases, 43 were treated with serum, generally in one dose, and of these 15 died, whilst of the controls (alternate cases) 23 out of 33 died. Several cases with advanced *B. pestis* septicaemia recovered, and 7 out of 8 cases with early septicaemia survived, as compared with an invariable fatality in the former group and 75 per cent. mortality in the latter. We anticipate that the use of the Haffkine Institute serum will save the majority of lives in classes B and C, and favourable conditions for a large-scale trial on these lines are awaited.

Treatment of Sprained Ankles

By W. E. TUCKER, F.R.C.S. (Eng.)

(Abstracted from *The Lancet*, Vol. CCXXI, October 17th, 1931, p. 848)

THERE are so many ways in which a sprained ankle may become chronic and lead to disablement that it is worth while considering them and noting how they may be avoided. Classification of sprains is difficult, but is best made under two headings, according to the direction of the displacement of the foot—i.e., (1) the adduction sprain, the common type in which the external lateral ligament and peronei principally suffer; (2) the abduction sprain, in which the internal lateral ligament and spring ligament bear the brunt of the strain.

In treatment, it is essential to estimate (1) the severity of the sprain, from physical signs and symptoms, and (2) the amount of exercise carried out after the sprain took place, from the history. This last factor

is important, since damaged structures have been used and will have been stretched, and will therefore take longer to recover.

The following rules appear to me to be common to the treatment of all sprains:—

- (1) Radiograph all sprains except mild ones.
- (2) Rest the damaged structures. If fracture of either malleolus has occurred the limb must be kept at rest for a longer period. If there is no bony lesion, endeavour to diagnose which ligaments and muscles are damaged and strap or bandage the foot in such a position that these are at rest and therefore have the best chance to mend; for example, in adduction sprains, strap the foot so as to prevent strain on the external ligaments and peronei.
- (3) Strap or bandage so that the foot is dorsiflexed to a right angle—a most important point, on account of the risk of shortening of the tendo Achillis from faulty position, and adhesions, from the products of effusion gravitating posteriorly, while the patient is in the recumbent position.
- (4) In bad sprains give some form of analgesic and hypnotic for at least the first night; the pain may be so bad that even morphia is required.
- (5) During the act of spraining an ankle, excessive movement undoubtedly takes place at the subastragaloid and mid-tarsal joints, as shown by effusion and injury to ligaments; therefore, when passive movements are started, remember to put these joints, as well as the ankle-joint, through their full range of movements.
- (6) After a sprained ankle, there is a tendency for the foot to become flat and painful, especially if strapped in an everted position. In order to prevent this, encourage the patient to do feet exercises to strengthen the muscles; an inside wedge or valgus support may be necessary while carrying these out.

SCHEME OF TREATMENT

I suggest that the following methods are efficient and, if carried out rigidly, will prevent chronic sprains. Warn the patient that it may be three to six weeks before the ankle is normal.

Moderate Degree.—(1) Ankle firmly strapped, walking allowed if not painful. (2) Massage and radiant heat applied over the strapping, and active movements, without producing pain, allowed from the beginning and continued until there is no pain or limitation of movement. (3) Strapping is removed on the fourth day, and if the ankle seems sufficiently recovered—as shown by absence of pain on passive movement to its full extent—it is thereafter supported by an elastic anklet or crêpe bandage until it feels to the patient completely recovered. (4) Do not forget to advise feet exercises to prevent recurrence, and also to guard against a painful flat-foot.

Severe Degrees.—(1) Confine to bed for a week if possible. (2) Firm pressure with bandages over lint soaked in some evaporating lotion—e.g., liquor hamamelis 1 in 6, or *lotio plumbi cum opio*. Do not strap bad sprains at first, but apply some form of evaporating lotion with firm bandaging. Swelling and œdema invariably occur and the patient suffers agony. On the other hand, firm bandaging over lint soaked in an evaporating lotion maintains the foot in correct position, rests the injured structures, and keeps the swelling from becoming excessive. (3) Next day the ankle is massaged gently, heat is applied, and active movements, without producing pain, are encouraged. Continue this treatment at least once each day, as it will help the absorption of effusion and hæmorrhage; a further range of movements should be obtained on each occasion. If available, diathermy through the ankle and surging faradism to the muscle will help to absorb deep-seated effusion more quickly than any other form of treatment. These can be applied from the first and their value can be estimated by the rapid return of the ankle to normal. (4) At the end of the week allow the patient up with the foot supported either by strapping, a firm bandage, or an elastic anklet. Massage

and physiotherapy are continued until full range of active movements is obtained without pain. The patient should carry out exercises.

Severe Degree with Fracture.—The same treatment as for the last group is applied, except that the patient is confined to bed for ten days; movements are not started until the seventh day; and the patient, when allowed up, must have his foot firmly strapped for at least three weeks.

I now suggest an alternative method for the last two degrees of sprain, which is applicable to patients unable to rest for longer than two or three days. The foot is firmly strapped so that damaged structures are well supported and the range of movement limited to a minimum. The patient is advised not to place the foot on the ground, but to walk with a crutch or the support of a stout walking stick. If possible, each day the ankle is given massage and physiotherapy treatment, as indicated before, over the strapping, but if this is out of the question the foot is left strapped for three weeks, after which time the strapping is removed and massage and physiotherapy treatment are started. If the foot is left strapped for three weeks, strong adhesions may have formed, which would necessitate a manipulation of the foot under an anæsthetic before massage and physiotherapy is commenced.

CHRONIC SPRAINED ANKLES.

Under this heading are considered:—

(a) Those cases that have had a certain amount of treatment but experience pain, localized to a particular part of the ankle, and limitation of movement. These symptoms are due to one or all of the following:—

- (1) Damaged structures being maintained in a wrong position and therefore stretched.
- (2) Teno-synovitis of one or several of the tendon sheaths.
- (3) Unabsorbed effusion in the subastragaloid and mid-tarsal joints.
- (4) Adhesions, especially posteriorly around the tendo Achillis, and around either malleolus.

If this class of sprain is seen within the first month, massage, movements, and physiotherapy is undoubtedly the best treatment, with the ankle supported in the correct position. If seen after the first month, the quickest method to obtain a supple, painless foot is to manipulate it through its full range of movements under an anæsthetic, in order to break down adhesions, following up with massage and physiotherapy treatment. Exceptions to this last method are those cases where a damaged ligament or muscle is stretched, as proved by tenderness over it, without limitation of movement; in which case the structure is put in a position of rest, by strapping the foot, and measures are taken to strengthen the muscles.

(b) Those cases in which a slight sprain occurred one to three weeks previously, and suddenly, usually after exercise, there is pain under the scaphoid, due to stretching of the ligaments and a tendency for the foot to become flat. Manipulation, followed by massage and movements, will break down adhesions and help to restore the tone of the muscles. The patient should be encouraged to do exercises and a valgus support may be necessary for a short time.

(c) Those cases in which the ankle is continually twisting. The object here is to strengthen the muscles, especially the peronei, and it is best accomplished by applying surging faradism to the muscles and carrying out appropriate exercises, such as contracting the muscles against an obstruction—e.g., attempting to evert the foot against a wall.

(d) Those cases which occur in older people, and in those who develop traumatic osteoarthritis. Treatment for these comes under the following headings: (1) Heat, massage, diathermy. (2) Valgus support, either raising the inner side of the shoe or an aluminium support. Undoubtedly some of these methods are open to criticism, but if they were carried out, sprained ankles would not develop the painful complications—such as teno-synovitis, a painful rigid foot from adhesions, or osteoarthritis—which help bone-setters and osteopaths to thrive.

SUMMARY

(1) There are two main types of sprained ankle. (2) X-ray all sprains except mild ones. (3) Rest in bed or on a couch for a period for all sprains except the mildest. (4) While resting, encourage active and passive movements without producing pain. (5) Give an analgesic and hypnotic for the first night, at least in bad sprains. (6) When putting the ankle through movements remember subastragaloid and mid-tarsal joints as well. (7) If pain and limitation of movement persist after one month, manipulate. (8) Support the ankle in convalescence.

The Protection of the Interior of Ceylon from Plague with Special Reference to the Fumigation of Plague-Suspect Imports

(Absorbed from a report by L. F. HIRST,

M.D. (Lond.), D.P.H.)

City Microbiologist, Colombo

It will be remembered that Dr. Hirst in 1913 showed that the prevalent, indeed the only, flea on Colombo rats was *Xenopsylla astia*. At the same time he hazarded the opinion that the relative absence of plague from certain areas in India such as Madras and Bengal might be possibly due to the fact that *X. astia* and not *X. cheopis* would prove to be the most prevalent flea in such areas. Cragg's work in 1919 appeared to support Hirst's suggestion. Later work in India by Taylor, Chitre, Dunn, and Goyle cast some doubt on his contention, at least as a generality. *X. astia* under laboratory conditions in Bombay proved to carry plague comparatively easily from rat to rat; in the United Provinces it was found that in many endemic areas the rats harboured *X. astia* almost exclusively, while in most parts of the provinces both species of flea seemed to thrive. Further work on more careful and methodical lines in the United Provinces, in Madras and in Colombo, have thrown some light on the matter, and have supported Dr. Hirst's views, if not totally, at least in many respects and particulars. Our present information on the matter may be shortly summarized as follows:—

(1) Both fleas (*cheopis* and *astia*) may cause epizootics and epidemics of plague. Epidemics due to *astia* however are shorter, less intense, and less often followed by plague in the next season. Endemicity due to *astia* when it occurs is of a lower intensity.

(2) The flea index of *astia* necessary to produce and maintain plague in rats is high, about 7; an *astia* index of 2 to 5 will not maintain plague.

A *cheopis* index of 1 or 2 may produce and maintain rat plague.

(3) *X. cheopis* is the more adaptable flea and can stand cold better than *astia*.

(4) *X. cheopis* is a more transportable flea than *astia*. Exported plague is usually due to *cheopis*. Board-ship life in the tropics suits *cheopis* better.

Its eggs are 'stickier' and adhere more easily to gunny cloth.

Dr. Hirst has some interesting remarks to make on the danger of plague being brought to Colombo with cargoes of rice from Indian and Burmese ports. The very interesting flea survey carried out by the Director of Public Health in Rangoon has shown that the most prevalent flea in the port area is *astia* and that *cheopis* is more prevalent in the town proper.

Dr. Hirst paid a visit to Rangoon however and pointed out that the centres for transportation of rice are not in the port proper but in the rice godowns of the town, and *cheopis* is found here. Rangoon is probably too far away from Colombo for infected fleas to survive and an epizootic amongst rats on board ship would be necessary to carry plague from Rangoon direct to Colombo. The nearer Indian ports however such as Negapatam are within striking distance of the survival of infected *cheopis*. Dr. Hirst and the Colombo authorities have been experimenting to find out if there

is any reasonably cheap and quick method of fumigating cargoes of rice at Colombo harbour. It is shown that lighters could be easily fumigated with hydrocyanic gas during the passage between the ship and the wharf. Dr. Hirst also outlines a method of fumigating sacks of rice in chambers carried on moving chains from the lighter to the grain godowns. He also discusses the desirability and the possibility of fumigating railway wagons of rice running from Colombo to the interior of the island. The spread of plague from the harbour areas to the interior of the island he has shown to be due to the exportation of *cheopis* and the growth there of such imported colonies. As a preliminary to these discussions Dr. Hirst gives an excellent summary of up-to-date information on the fumigants used in plague work. The cyano-gas compounds hold the field easily for efficiency and are available in the form of 'discoids' of wood fibre impregnated with hydrocyanide gas, as cyano-gas (calcium cyanide), and as Zyklon. Liston's cyanide fumigator has been used with very successful results in Ceylon. Sulphur dioxide cannot compete in efficiency, though still largely used. A closer study of fumigants and other considerations leads to the conclusion that in rat-proofing lies the solution of the carriage of plague by shipping. This principle is now in actual practice, especially in the United States. Dr. Hirst's pamphlet is a very valuable contribution to modern conceptions of plague and is full of information and detail that cannot be summarized.

Leucorrhœa

By L. C. CONN, M.D., F.R.C.S. (C.).

(Abstracted from the *Canadian Medical Association Journal*, Vol. XXVI, January, 1932, p. 48)

THE treatment of leucorrhœa is in many instances very difficult both for the general practitioner and for the gynecologist. In the discussion of this paper only a few of the known causes will be touched upon. One cause for difficulty may be the general condition of the patient. Patients with anemia or general debility of any kind may develop leucorrhœa, and this applies especially to young girls. Sometimes there may be an endocrine disturbance. One has to be careful in this class, however, not to overlook a local condition of the cervix which may have developed. A very common cause for leucorrhœa is a gonorrhœal infection. Here one gets evidence of infection in Skene's tubules, in the Bartholinian ducts, in the urethra, and in the cervix.

The urethra should be treated until there is no pus present after massage of the floor of the urethra through the vaginal wall. One must bear in mind, also, that occasionally a stricture in the urethra may occur and that this will have to be treated by dilatation. The failure to pay sufficient attention to the urethra is the cause of re-infection in many cases. I have one patient in mind now who had had at least three different attacks owing to the fact that the urethra had never been treated. This woman had a well-developed stricture in the urethra and following dilatation the condition rapidly improved.

Even after the slides from the cervix and the urethra are negative it does not necessarily follow that the condition is cured. The treatment will have to be directed to the urethra, to Skene's tubules, to the Bartholinian ducts, to the cervix and to the tubes, if necessary. I very rarely find it necessary to remove the tubes in cases of gonorrhœal infection, especially in young women, because most of these cases can be made very comfortable under treatment. There are very few of these cases from the 'out-patient' department that have had to be operated on in the last few years. As a matter of fact the patients who have been operated on are those who are most difficult to relieve. If it is necessary to operate I am in favour of being rather radical, removing both the tubes, and perhaps the ovaries, and nearly always part or all of the uterus.

Another group of cases comes under the heading of infections of the cervix. Here one may have a simple

erosion or laceration, or a chronic inflammation of the cervix, with or without cyst formation. The use of the electric cautery will, in most cases, clear up this condition. Since employing the electric cautery I have not found it necessary to operate as often as I did some years ago. One should use the electric cautery, even though the woman is pregnant. I have not seen any ill effects from this up to the fourth month of pregnancy. It is possible that one may remove a focus of infection which might flare up after delivery.

The cervix should be carefully inspected after delivery in every case and if a deep laceration is present it is best to have it repaired immediately. Certainly no woman should be discharged after delivery until one has examined the cervix at the end of the sixth week. Every patient should be told that it is not natural to have a persistent leucorrhœa, and she should be advised to have a pelvic examination if such a condition occurs in the future, and more especially at the time of the menopause. I believe that more careful attention to the cervix will cut down the incidence of cancer in the years to come.

Chronic cervicitis may also be the cause of pain in the lower abdomen, which may be relieved by clearing up the condition. Unfortunately, some of these cases are operated on because the surgeon is not aware that the pain may be caused by pelvic cellulitis secondary to chronic cervicitis. Occasionally chronic cervicitis may act as a focus of infection and cause trouble in other parts of the body. One must be careful, however, not to think that every cause of chronic cervicitis is necessarily acting as a focus of infection. For the more severe cases of laceration or infection of the cervix it may be necessary to operate and I believe that the Sturmdorf operation is excellent here. Following this operation there should be very little mucous membrane left behind in the cervix.

There is another cause for leucorrhœa that is not receiving the attention that it should from the general practitioner, and that is *Trichomonas vaginalis*. This organism causes a foamy discharge, slightly tinged with yellow, which in many women is very irritating. The irritation is most marked at the end of the menstrual period and one is more likely to find the organism at this time.

Trichomonas vaginalis is a pear-shaped organism, usually larger than a pus cell, although varying somewhat in size. It has four long flagella springing from its anterior pole and a short tail-like process extending from its posterior pole. The organism is propelled quite rapidly by means of the whip-like action of these flagella. The flagella can seldom be detected in fresh preparations unless the organism is in motion.

I have discovered this organism in many pregnant women and also in nulliparæ and multiparæ. I found it on one occasion in a girl sixteen years of age, and this case was very difficult to treat.

We do not know definitely where this organism comes from, nor are we sure that it always causes symptoms in every woman. It is supposed by some to come from the bowel. In order to clear up the condition ordinary tincture of green soap is used to scrub out the vagina. The vagina is then dried and a tampon soaked in boroglyceride is inserted. It is best to give a series of treatments using this technique. The patient is advised to wash out the vulva once a day with tincture of green soap. Also, a lactic acid douche should be taken once a day, using one teaspoon of lactic acid to one quart of water. The patient is then examined at the end of the menstrual period and slides are taken. If no organisms are present after three periods one is fairly safe in discontinuing active treatment. A certain number of these cases, however, will have recurrences.

There is still another cause for leucorrhœa and up to the present time not much attention has been paid to it. It is the monilia or yeast fungus. The yeast fungus may be present without causing any symptoms. As a rule it does not cause much discharge, but the reaction of the vagina is usually highly acid. This infection may

also be present in pregnant women. Parous women are more often infected than nulliparæ. The symptoms caused are itching, burning and smarting of the lower vulva and vagina. Digital examination, speculum examination, and sexual intercourse may be painful. The organism may be found by the ordinary examination under the microscope, or one may stain it. It may also be grown in culture. The treatment recommended is 1 per cent. gentian violet in aqueous solution. Alkaline douches are also advised.

Cancer Cures

By IRA I. KAPLAN, M.D.

(Abstracted from the *American Journal of Cancer*, Vol. XVI, January, 1932, p. 210)

EVER since the recognition of cancer in the primitive eras of civilization, attempts have been made to control and eradicate this disease, some of the ancient remedies suggested for its treatment bordering on witchcraft, alchemy, and crude chemistry. In 50 B.C., however, surgical treatment of cancer and even radical mastectomy were practised. In spite of all efforts since then to find other means of treating the condition, surgery has remained the method of choice. Although to this day no direct panacea for cancer has been discovered, it is not inconceivable that some time in the future something will be found to prevent this scourge from pursuing its destructive force.

The fact that the cause of cancer is still a mystery accounts for the existence of the illegitimate exploitation of so-called cancer cures. Because every possible agency should be utilized in treating and caring for cancer cases, we are constantly on the watch for some reliable means to effect our purpose. At present surgery, roentgen rays, and radium, either alone or in combination, constitute the best weapons for combating cancer. Nevertheless, since more than once a useful invention has been discovered by chance, we continue hopeful that some suggested cancer procedure may prove efficacious. We feel in duty bound to receive with open mind every suggested cancer remedy for trial and examination.

Even to-day the old remedies long ago suggested and discarded are from time to time resurrected, revised, and, under different names, offered to the gullible public as new-found cures. Often the cure submitted for trial can be traced to an ancient formula exploited by some charlatan years ago. True, some of these remedies do actually destroy the cancerous growth, but usually at a terrible cost to the host.

All kinds of agents have been suggested as cancer cures—vegetable, mineral, gaseous, chemical, and mechanical. To name only a few, the following may be listed: cod-liver oil, sarsaparilla bark, hemlock, *Sanguinaria canadensis*, soda, potash, mercury, iodine, bromine, arsenic, camphor, morphine, zinc, arsenic, gold, antimony, and various destructive acids and caustic ointments. Divers fantastic, semi-surgical methods have been used, too, as strangling the growth by tying a tight cord or wire about the base, using the chain saw, and freezing the cancer. In addition, numerous escharotic pastes, which destroy the growth itself, have had their advocates.

In 1767, Dr. J. Burrows, an English cancer specialist, proposed a cancer cure made of the milk of goats fed on hemlock. In 1817, a man named Ashby offered to the Middlesex Hospital, England, a supposed cure for cancer, in the form of a plaster. Cancer, he claimed, was due to worms which, by the application of his plaster, could be withdrawn, thereby permitting the cancer to heal. Given an opportunity to try his method under scientific auspices, he was caught sliding the 'cancer worms' out of his sleeve into the lesion.

Justamand, in 1780, used an escharotic paste, a mixture of antimony, arsenic, and the white of eggs. In 1856

Velpeau offered a cancer paste made of sulphuric acid and saffron and in 1857 Dr. Fell used a decoction of gas brought up from the stomach directly by belching sanguinaria or bloodroot, zinc chloride, flour, and cochineal, at the same time giving the patient a pill of bloodroot, arsenic iodide, and extract of conium. There were, also, various pastes, such as Vienna paste, of potash and quicklime; Manec's paste, of arsenous acid, cinnabar, and burnt sponge; Canquoin's, of zinc chloride and flour; and Bougard's, of arsenic, cinnabar, corrosive sublimate, zinc chloride, sal ammoniac, flour, and starch. Another enthusiastic worker with pastes for external use was Dr. Marsden, who in 1850 used a paste composed of arsenous acid with mucilage of gum acacia. One of the best-known pastes was that used by the quack Michel, made from sulphuric acid and powdered asbestos. All these workers relied on the escharotic powers of the chemicals used and were able to bring about some healing of the local lesion, being unsuccessful however, in cases of generalized carcinoma.

It is because of the failure of the legitimate physician to produce a cure for cancer that quacks of all kinds are enabled to prey successfully on the public, always eager for a miracle. Every new treatment suggested for other diseases is seized upon as a possible cure for cancer. When the injection treatment for tuberculosis and syphilis came into use, it was offered, also, as a cancer cure, and quacks easily seized upon these newer remedies in the hope of reaping a harvest from cancer sufferers.

When in the latter part of the eighteenth century electricity was made practical by Volta's discovery and construction of a battery, and in the early nineteenth century by the construction of the various electrical coil machines, this mysterious power was seized upon by the unscrupulous as a new means of combating cancer. All sorts of so-called electrical cancer belts, coils, rings, and contraptions were sold.

Suddenly, in 1898, the world was startled by the discovery of radium by Professor and Mme. Curie. Immediately the quacks bestirred themselves, and all sorts of radium pastes, waters, oils (notably the radium oil of Harris), pads, and appurtenances were thrust upon cancer patients as panaceas for their ills. It was this widespread fraudulent abuse of the name radium that in the early years hindered the legitimate employment of that agent by properly qualified physicians. Only in the last twenty years has it regained recognition as a real therapeutic value.

Even now, on account of our inability in a large number of cases to control cancer, the quack has utilized the opportunity to display his wares. During the past decade numerous cancer cures have been offered, having as their basic formula some old escharotic compound resurrected from ancient laboratories, and disguised by fancy labels. The most notorious of these are the Tilton and the Hoxey cancer cures.

In 1924 the profession was startled by a physician of Detroit, who claimed to have discovered the cause of cancer, and to have perfected a remedy. This, too, proved a false hope.

The discovery of specific germs or parasites for many infectious or contagious diseases has led to much research along these lines in the hope of finding a germ or parasite responsible for cancer. As a consequence, every now and then the discovery of a cancer germ is announced. Some of the advocates have been honest and sincere, and, when their claims have been tested and found wanting, have readily withdrawn them. Others, unfortunately, have found it profitable to exploit both the profession and the public. Recently Dr. Schmidt has devised a new parasitic theory, and presented an antiparasitic fluid for injection into cancer patients. So far it has not proved efficacious. A physician resident in New York City has put forth the claim that cancer is caused by a specific germ and that he has been able to produce a serum that destroys this

germ. This, too, has remained only a hope and not a fact.

In recent years the employment of glandular therapy in various constitutional disorders has received new impetus through the discovery of insulin. A most startling announcement was made by a Russian physician, who suggested a glandular extract for the treatment of cancer. His material was said to be an adrenal cortex product combined with some iron compound, which would produce such a large amount of oxygen that the cancer cell could not survive. Hardly had this been tested, when two California physicians broadcasted their findings with adrenal cortex extract, but once again hope has been unwarrantably aroused, for this latest cancer cure has failed.

Nor is America alone in the exploitation of glandular extracts. A Japanese, Dr. Toshio Ishihara, claims to have discovered that cancer is a result of glandular imbalance and that, by the judicious use of a compound of several glandular extracts, the disease can be cured. This compound, called POU, represents the hormones of placenta and corpus luteum with tissue from Wharton's jelly.

Thus far all the alleged cancer cures on an endocrinological basis have failed. But the public, both lay and professional, still take too much for granted provided the publicity given is broad enough.

In conclusion one can say only that up to the present no cancer cure has proved of value, except surgery, x-rays, and radium.

Offensive Breath

(Abstracted from the *Lancet*, January 2nd, 1932, p. 36)

HALITOSIS, as it is called politely, is one of those minor disorders that make life a misery. When aware of it the sufferer can easily develop serious depression and a painful sense of inferiority. To prevent such a misfortune the courteous Japanese, it is said, consider it good manners to inhale continuously through the mouth (like an inverted ostler) during propinquity with a stranger's breath; whereby they mean to imply that nothing could be sweeter. Even we, in relatively barbarian lands, will suffer much before mentioning fœtor oris to our friends, and often perhaps this is kind only to be cruel. The medical practitioner, at any rate, should be very ready to consider and deal effectively with any such disability encountered in a patient, and he must certainly be the last to dismiss it as trivial because the cause is not apparent. First he will probably, and rightly, think of the mouth, and it is interesting to find that H. Prinz, reviewing the subject as a dentist, attributes offensive breath in at least 90 per cent. of all cases, to prolonged stagnation of food debris about the teeth. Both carbohydrate and protein may undergo decomposition in cavities and crevices around the teeth, and any actual pyorrhœa or exposed gangrenous tooth pulp increases the odour. That food debris alone is often responsible is shown by the fact that artificial dentures which are not kept perfectly clean may become quite definitely offensive though their owners are edentulous and have no gingivitis. Wherever, therefore, there is bad breath most careful search is necessary for evidence of dental sepsis or carelessness in removal of food debris by frequent cleaning—though there is always a danger that vigorous brushing with a hard brush may damage the gums and allow organisms to enter the tooth margins.

After the teeth the next commonest source of fœtor oris is probably chronic pharyngitis and tonsillitis. The tonsils may appear normal on superficial examination, but more thorough search may reveal crypts containing cheesy and highly offensive material which is the cause of the smell. This is a very important condition which may only respond to tonsillectomy, though local application of silver nitrate to the crypts is sometimes effective. Chronic sinusitis is more usually productive of a bad taste noticed by the patient himself than of

any marked factor in his breath; atrophic rhinitis or ozæna is, of course, a recognised though luckily rare, disease in which the breath is particularly foul. Informed opinion has it that digestive disorders less often cause offensive breath than might be expected—gas brought up from the stomach directly by belching is usually odourless, but may sometimes have a smell of fermentative fatty acids or hydrogen sulphide. This, however, is the smell of flatulence and not of ordinary breathing. Quite different is the origin of substances absorbed from the intestinal tract and excreted by the lung, but with experience of onions and alcohol, it is easy to imagine that tainted breath is very often due to alimentary putrefaction. Thus, it is generally believed that constipation is pretty commonly responsible. But those best qualified to judge seem to think that the products of abnormal bacterial fermentation seldom travel from the colon to the breath unless there is actual disease of the mucous membrane. Constipation, they say, is not often to be blamed for offensive breath, notwithstanding the widespread belief to the contrary; enteritis is a more frequent cause than colitis, gastritis—in the absence of pyloric stenosis—less common than either.

There is no need here to do more than mention the kinds of offensive breath encountered in chronic pulmonary disease, the characteristic smells associated with uræmia, and diabetes, or the odours said to be recognisable in certain fevers and—especially by animals—when death is imminent. The problem with which we are concerned is the problem of the ambulant man, woman, or child whose trouble may be a source of much distress. In far the greatest number of such cases fœtor oris has its origin in the teeth, tonsils, nasopharynx, or respiratory tract; in only a relatively small proportion is it traceable to metabolic or digestive disorders. Treatment and prevention must thus mainly be directed to the local conditions around the oral cavity, and it is correspondingly unwise to begin by concentrating one's attack on liver and bowels.

Reviews

INDEX OF PROGNOSIS AND END-RESULTS OF TREATMENT.—Edited by A. R. Short, M.D., B.S., B.Sc., F.R.C.S. Fourth Edition. Bristol: John Wright and Sons, Ltd., 1932. Pp. xi plus 599. Price, 42s.

THE first question that is asked by relatives or by the patient himself after a doctor has examined him refers to the prognosis. The patient may put the question in the form of an enquiry as to the diagnosis, but he does not really want to know the exact pathological condition, he wants to know what the chances are of eventual recovery and the length of time that he is likely to be incapacitated. A medical practitioner will often be judged on the accuracy of his answer to these two questions, rather than on the correctness of the diagnosis; a mistake regarding a diagnosis will often remain undiscovered, but a wrong prognosis is a chicken that will invariably come home to roost.

The idea of publishing an index of prognosis was first conceived less than twenty years ago and in 1915 the first book of the kind was published as a companion volume to an index of treatment already issued by the same firm of publishers. The project was a bold one because the average men will not at first see what this book can give one that is not already to be found in text-books. The compilers were probably the first to be convinced as to the urgent necessity for a book of this kind, because of the extreme difficulty they

encountered in finding the facts they required from the available literature, so much so that in many instances enquiries amongst hospital ex-patients had to be instituted to fill certain obvious gaps. To get an unbiased opinion as to the end-results of many special forms of treatment is extremely difficult. Medical writers are not necessarily deliberately dishonest in reporting their results, but they are inclined to be over-enthusiastic regarding their own particular forms of treatment, to assume too much, and to allow their writings to be tinted with *le couleur de rose*. In America the 'follow-up' practice has become highly developed, in England it is coming into favour more and more each year, but in India one can almost say that with regard to general hospital patients the practice does not exist. There is no excuse for this, as anyone in charge of Pasteur institutes will attest; about 80 per cent. of replies are obtained by their 'follow-up' system.

This particular book has probably done much to stimulate this important subject. It is in its fourth edition, it is considerably enlarged, and the list of contributors is increased, now numbering about thirty. The contributors are all well-known members of the staffs of British hospitals; the tropical disease sections are by Sir Leonard Rogers.

It is perhaps unnecessary to say that although prognosis is given the most important place, diagnosis and treatment are dealt with quite fully though not in detail; that is to say operations, drugs, etc., are named, but no details of technique or prescriptions are included.

The volume forms an excellent and important companion to three other volumes published by the same firm on differential diagnosis, symptomatology, and treatment, respectively. The general practitioner who possesses these four volumes will feel fully equipped. We notice that the complete sets are sold at a price slightly lower than the aggregate of that of the individual volumes. We can strongly recommend them as good value for the money.

L. E. N.

CHEST DISEASE IN GENERAL PRACTICE.—By P. Ellman, M.D., M.R.C.P. London: H. K. Lewis and Co., Ltd., 1932. Pp. xv plus 266, with 132 illustrations. Price, 15s.

THE General Practice Series of monographs is a comparatively recent addition to a class of publication which at the present time is so popular with the medical profession.

The volume on chest diseases should prove of great value to the busy practitioner although the title is deceptive, for the book contains the story of pulmonary tuberculosis with its differential diagnosis and that only.

The author's object, as stated in the preface, has been to assist the general practitioner and the senior student of medicine in the routine examination of chest cases and to give them a general picture of the modern conception of phthisis with special reference to recent advances in our knowledge of chest disease and their practical application in diagnosis and treatment.

He has succeeded admirably and has drawn a word picture of the modern conception of phthisis that could scarcely be improved.

An introduction discusses the pathology of the condition and more particularly the onset and spread of the almost universal infection. Chapters on early diagnosis and differential diagnosis follow, and in these the absolute importance of radiology is stressed if accurate diagnosis is to be expected. There is a chapter on pulmonary diseases in children and one on industrial diseases, but here the author is really discussing the differential diagnosis of phthisis. Treatment is adequately described and the important problems of prognosis and capability for work are discussed.

Sanatorium treatment, collapse therapy and the part played by drugs and diet each receive their share of attention, and the reviewer realises how far we in India are behind the standards that are now set up in Western countries.

Tuberculosis officers with their dispensaries and clinics are rare in this country, and where they exist do not provide the skilled methods required for early diagnosis. Village settlement, the boarding out of children from contacts, health visitors and the careful examination of all contacts are methods of prophylaxis which have produced great results in England. They do not exist in India.

The sanatorium remains the sheet anchor for the treatment of the established disease. From absolute rest through carefully-graded successive stages to controlled and then full work, the patient is led and guided. The sanatorium is the school and the physician is the teacher. Some patients may be entirely cured when they leave, but the majority have learned how to regulate their lives so that the infection which remains continues inactive and dormant.

Every practitioner in this country has to deal with cases of pulmonary tuberculosis. In this book he will find all that he can do to form an early diagnosis, and to carry out an adequate method of treatment. In but few places and with but few patients will he be able to realise his ideals, but he will have the satisfaction of knowing that he has attempted to the best of his ability and resources to treat his patients by the most approved modern methods.

H. H.

FUNCTIONAL DISORDERS OF THE GASTRO-INTESTINAL TRACT.—By W. G. Morgan, M.D., F.A.C.P. London: J. B. Lippincott Company, 1931. Pp. xii plus 259, with 32 illustrations. Obtainable from Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 15-12.

This book of Professor Morgan on the functional disorders of the gastro-intestinal tract is an excellent treatise on the subject and has several attractive features about it. The first one is that, unlike most medical text-books, it contains a record of several original observations and experiences of a specialist who is widely known in the United States for his therapeutic skill in the management of cases of gastro-intestinal diseases. The professor has given several histories of interesting cases that he himself has handled and also details of such treatment that actually benefited them. The second important feature about the book is the large number of useful illustrations that it contains. The radiograms are excellently reproduced and very helpful; the series of figures illustrating the method of conducting abdominal exercises for the prevention and cure of habitual constipation are also invaluable. The third attractive feature about the book is its general get up and binding. The design of the cover is said to be a reproduction of the binding, made in Cambridge in the sixteenth century, of the renowned 'Summa Magistri' by Johannes De Santeo Geminiano, published in Basle, Switzerland, by Froben and John Petri in 1499. It is so unusual and beautiful that the volume will grace any collection of books in which it is included.

Lastly, the book is designed to supply a long-felt want of the general practitioner who has no time to specialise in any one branch of medicine by providing him with a brief treatise on the diagnosis and treatment of gastro-intestinal diseases.

K. V. K.

HEADACHE.—By William H. Robey, M.D. London: J. B. Lippincott Company, 1931. Pp. xiii plus 234. Obtainable from Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 15-12.

WITH the exception of the common cold, headache is probably the medical profession's greatest bugbear. Anything may cure it but there is nothing that will do

so with any degree of certainty. The patient is able to prescribe a cure much more frequently than the cleverest physician. It does as much harm to one's reputation if a patient whom one has frightened away by suggestion of expensive investigations is cured by a rival with a dose of salts, as the death from cerebral tumour of another patient whose headache one has pooh-pooh-ed. In these days, when aspirin is classed with bicarbonate of soda as a household necessity, the physician is seldom consulted unless a headache is persistent or of an unusual kind. This doesn't make it any easier to deal with the problem, and for this reason every practitioner will welcome this monograph.

We cannot get away from the feeling that the book was written to order. Furthermore we are certain that the author acquired a severe headache whilst wondering how on earth he was going to cover two hundred pages. He started systematically by putting down a number of chapter and sub-headings and then when he settled down to fill in the text he found that in about half the cases he had nothing to say and so he just ruminated, as for example, in chapter IV, 'Pathology of Headache'. Again in chapter V, 'Classification of Headache', the author makes no attempt at producing a classification but gives suggestions for taking a case history—very useful suggestions too. But if the author has failed to fill in some of the headings satisfactorily, he has succeeded admirably with others—migraine, for example.

The practitioner will find the book excellent reading, full of useful hints learnt from personal experience. The English is not of the most felicitous, but those who do not mind reading, 'In searching for the cause, the right tonsil appeared to be infected' will have no complaints on this score. The book contains numerous useful references and the format of this series—the Everyday Practice Series—is both artistic and practical.

HANDBOOK OF TROPICAL FEVERS.—By N. P. Jewell, M.D., D.P.H., F.R.C.S.I., and W. H. Kauntze, M.D., D.P.H. London: Baillière, Tindall and Cox, 1932. Pp. xii plus 485, with 92 figures in the text. Price, 16s.

It is not very easy to see what particular gap this book fills. It is not a treatise on the whole range of tropical diseases, nor on any ætiological or geographical group, nor does it confine itself to tropical fevers, as its title suggests. We have before urged the necessity for books on 'regional' tropical diseases. Here was an opportunity for the authors to have written a book on tropical diseases of Kenya Colony, or, if a slightly wider range was thought advisable, of East Africa. We know the answer to our implied question; the publishers will not allow it. It is difficult enough to sell a book on so limited a subject, however good it may be, but when its scope is limited still further, the thing becomes impracticable! But we are being led away into personal reminiscences and must get back to our subject. On further consideration, we do see a quite definite use for this book; to supplement the ordinary text-book on medicine, for the use of under-graduate students whose curriculum demands that they shall be able to answer a question on tropical medicine, or for candidates for certain special examinations in tropical medicine. For this purpose the book is of distinct value; the facts are there and, though given concisely, they are given at sufficient length to satisfy most examiners.

There are twenty-five chapters, each on a separate disease except where diseases fall into obvious groups, such as the enteric and the typhus groups. All the common tropical diseases are included (In what tropical disease does not fever occur?), even oriental sore, to which ten pages are devoted. There is a chapter on melioidosis, which in a book of this kind is very hard to justify; it is apparently a rare glanders-like disease with an ill-defined clinical syndrome and a doubtful ætiology. We hesitate to suggest that it was included for diplomatic reasons.

It is not possible to discuss the chapters individually. The facts are presented concisely and correctly, but the

values are often all wrong. In many of the chapters one feels the authors' lack of personal experience. This is of course inevitable.

As we have already said, this is an excellent book for examination purposes and for students we can thoroughly recommend it. The format is good and the price reasonable.

L. E. N.

THE SCIENCE OF SIGNS AND SYMPTOMS.—By R. J. S. McDOWALL, D.Sc., M.B., F.R.C.P. (Edin.). London: William Heinemann (Medical Books), Ltd., 1931. Pp. 440. Illustrated. Price, 21s.

SOME years ago Dr. McDowall wrote a book on clinical physiology. This book met with marked success, and two editions in England and America have become exhausted. This is not surprising, for it was a very useful publication, and indeed invaluable to all students preparing for the higher examinations and for those who wished to understand the relation between their physiological knowledge and clinical experience.

Dr. McDowall has expanded his previous work and has changed its name. The result is excellent and the author adequately discusses the scientific bases of all the more important signs and symptoms. It is not possible in a short review of this kind to deal in detail with the large amount of material that is collected in this volume. It must be sufficient for the reviewer to state that the common symptoms of all deranged functions receive their due share of notice and explanation. Nothing is omitted and it is all of great interest and value. The medical student who wishes to obtain a logical reason for his clinical experiences will find it here.

The older practitioner, who may have forgotten to some extent the sciences on which his rules of diagnosis and methods of treatment are based, will find new knowledge set out in a manner that is simple and most interesting.

The seeker after higher medical degrees cannot afford to do without this work.

It is very well arranged, printed and produced. There is a selected bibliography and a complete index.

H. H.

EMERGENCY SURGERY.—By H. Bailey, F.R.C.S. (Eng.). Vol. II. Bristol: John Wright and Sons, Ltd., 1931. Pp. xvii plus 415, with 430 illustrations, some of which are in colour. Price, 25s.

THIS is the second and concluding volume of Mr. Hamilton Bailey's book, of which the first was reviewed in these columns last year. A better title for the book would be 'Treatment of Surgical Emergencies', and since it deals not at all with diagnosis or pathology, but within its own sphere it is packed with good things. It is intended as a guide to those who, without much experience behind them, are called on, whether as junior members of a surgical staff or as general practitioners, to be prepared to deal with any sort of surgical emergency, often of a kind which text-books dismiss with scant notice, or which may call for prolonged search in text-books of the specialities. Hence the field ranged over is very wide, from the best methods for dealing with foreign bodies in the ear or the treatment of an alveolar abscess, to the most modern methods of resecting the different parts of the intestine. It is plain that the author has had a wide experience as a resident surgeon and exceptional opportunities for the study of acute cases, to which he has brought wide reading and an original mind. His directions, if at times didactic, are always clear and helpful and in line with the latest work. In this volume the specialities are dealt with by experts and we find excellent articles on the emergencies of the eye, ear, nose and throat, and on such subjects as bronchoscopy and oesophagoscopy. To have all these in one volume will often save much laborious searching in special text-books.

In the general surgical sections a most useful chapter on the procedure to be followed in impending death under anaesthesia is to be highly commended, as also the directions for dealing with suppurations about the neck and submaxillary regions. The operation of ligation of the angular vein to prevent cavernous sinus thrombosis in cases of facial carbuncles is described and illustrated and Eagleton's method of ligation of the common carotid artery and enucleation of the eye is recommended for the treatment of the condition when established, though one is not told what the expectation of success following this method is. A neat method of elevating depressed fractures of the zygoma is described and illustrated and will interest surgeons in India, where this accident following a blow from a polo ball is not uncommon and is liable to lead to limitation of the movements of the jaw if not elevated.

The operations for fracture of the skull are well described, but the use of a trephine is more lengthy and laborious than the making of the opening by means of a Doyen's burr, which is then extended by Montanovesi forceps, a method which is both quicker and less dangerous. The operation of laminectomy is hardly likely to be required as an emergency and the same remark applies to many of the ligations of arteries described in the latter part of the book, but their inclusion makes for completeness.

The whole work may be recommended as an excellent and trustworthy guide to this difficult and trying branch of surgery. Needless to say the printing and binding are excellent and, as in the first volume, the illustrations numerous and beautifully executed.

W. L. H.

CLINICAL OBSERVATIONS ON THE SURGICAL PATHOLOGY OF BONE.—By David M. Greig, M.B., C.M., F.R.C.S. (Edin.), F.R.S.E. Edinburgh: Oliver and Boyd, 1931. Pp. xi plus 248, with 224 illustrations. Price, 30s.

THE post-graduate courses which are held in Edinburgh each year during the vacation attract many students from India and all who have attended the surgical course will recall the interesting lectures on the surgical pathology of bone diseases delivered by Mr. Greig, as part of that course in the museum of the Royal College of Surgeons. The lectures are illustrated by lantern demonstrations of many beautiful specimens, but as the room is in darkness during the lecture it is impossible to take notes at the time, with the result that one's recollections jotted down afterwards are apt to be fragmentary and to miss the thread of the lecturer's argument. This book sets out in detail a scheme of bone pathology which is based on Leriche and Policard's theory of ossification, according to which de-differentiation into a primordial tissue, common to bone, fibrous tissue and cartilage must first take place and which denies any special powers of bone formation to the osteoblasts, these being looked on merely as enlarged fibroblasts. What happens thereafter depends on two factors, adequate blood supply and adequate supply of calcium. Dale's work on histamine and choline is freely quoted and on this basis the view is built up that hyperæmia causes rarefaction, decalcification and porosis, whilst vascular obstruction causes osteosclerosis. For the formation of new bone increased calcium is needed; this is supplied by local decalcification the result of hyperæmia. When the hyperæmia diminishes, decalcification takes place and new bone is formed.

In the light of these views a series of specimens of various inflammatory diseases of bone is examined and described in detail in order to demonstrate how the changes found may be explained by alterations of the condition of the circulation. Whether one accepts Mr. Greig's views or not, one must admit that they are set out in an able and interesting manner and the numerous illustrations are beautifully executed. The book will be read with interest by all pathologists.

W. L. H.

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(Lancet, 1931, 1, 323)

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(*Journ. Amer. Med. Assn.*, May 3, 1930, p. 1428.)

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A DESCRIPTIVE ATLAS OF RADIOGRAPHS.—By A. P. Bertwistle, M.B., Ch.B., F.R.C.S. (Edin.). Second Edition, Revised and Enlarged. London: Henry Kimpton, 1932. Pp. xxvii plus 552, with 767 illustrations. Price, 42s.

THE taking of successful x-ray pictures is undoubtedly work for a specialist. The general practitioner may use a small or portable apparatus for the diagnosis and subsequent examination of fractures, but without any special training and suitable apparatus he should not attempt to go beyond this. The reading of skiagrams is even more of a specialist's job. Yet, if the physician or surgeon is to take full advantage of the wonderful possibilities of x-ray diagnosis, he must be in a position to understand the radiographer's necessarily-brief description of his findings and to apply them to the clinical condition of his patient of which he on his side must have a much clearer picture than has the radiographer. Thus, though he need know nothing of the electrical technique of taking x-ray pictures, everything that he learns about the reading of skiagrams must add to his efficiency as a clinician. For this reason, before seeing what the specialist has to say on the subject, it is an excellent practice to try to make one's own diagnosis when presented with an x-ray picture. Though you will usually accept the reading of the expert, there may be occasions when your superior knowledge of the clinical condition will entitle you to ask him to reconsider his decision.

For the purposes of the clinician, the 'atlas' is the ideal form of radiographical literature. The book under review he will find particularly helpful. There are about 750 skiagrams of all parts of the body, both normal and diseased. The skiagrams have been made 'fool-proof' by placing a small outline diagram in the corner of each plate so that the most obtuse could not fail to see the abnormality, and yet the skiagrams themselves are not touched up in any way, and one is face to face with the real thing—in so far as a reproduced print ever can be the real thing. Each picture is accompanied by a short clinical history of the case and a radiographical diagnosis. Otherwise there is little text in the book. There is a chapter on 'milestones in radiography'—it is interesting, but does not form an essential part of the book—and another justifying the adoption of the silhouette radiographic progress, whose advantages seem too obvious to require justification.

The atlas proper begins, as it should, with 'normals', including normals at different ages, a very important point, and then proceeds systematically to depict radiographically the various abnormalities, congenital and acquired, of all parts and organs of the body.

The present edition is enlarged and is absolutely up to date. Both the junior and the experienced radiographer will find it extremely helpful, and the clinician, be he physician, surgeon or specialist, will find it invaluable. The atlas is excellently produced and we can recommend it to medical men of all classes.

NOTES ON RADIUM THERAPY.—By H. A. Colwell, M.B., Ph.D., M.R.C.P. (Lond.), D.P.H. (Oxf.). London: H. K. Lewis and Co., Ltd., 1931. Pp. x plus 165, with 15 illustrations. Price, 6s.

THIS little book, which only professes to be a collection of notes on radium therapy and not a text-book on radium surgery, is written in a very attractive style and deals with all the essential features of the subject. There is a fascinating chapter on the physics of radium, followed by a description of the various forms of radium applicators. There are also chapters on the therapeutics of radium and its chemical effects. An account is then given of the radium treatment of those forms of cancer in which radium is usually employed. Finally, the recommendations of the X-ray and Radium Protection Committee are included.

On the whole it is an excellent little publication and should prove useful not only to students, but to those practitioners who are not experts in radium treatment,

but who wish to be in a position to give the best advice to their patients.

J. A. S.

RADIUM AND CANCER.—By H. S. Souttar, C.B.E., M.D., M.Ch. (Oxon.), F.R.C.S. (Eng.). London: John Bale, Sons and Danielsson, Ltd., 1932. Pp. 64. Illustrated. Price, 2s. 6d.

ANY publication by such a distinguished author must be treated with respect. While in a book of such small compass one must not expect a subject of such wide dimensions as radium surgery to be dealt with adequately, one may read with interest and advantage what is compressed into a very few pages. The author selects the method which he has personally found most successful in practice, and hopes thereby to arouse a wider interest in a fascinating subject.

The book follows the usual plan of successive chapters on the physics of radium, apparatus and means of application, short descriptions of the radium treatment of the more common forms of cancer, and finally a chapter on accidents following the use of radium.

J. A. S.

PROTECTIVE MEASURES AGAINST DANGERS ARISING FROM THE USE OF RADIUM, ROENTGEN, AND ULTRA-VIOLET RAYS.—By Professor H. Wintz, M.D., Ph.D. League of Nations, Health Organisation. Official No. C.H. 1054. Geneva. August, 1931. Price, 3s. or \$0.75.

THIS brochure, issued by the Health Organisation of the League of Nations, deals, as its title indicates, with the protective measures necessary in the various forms of radiation mentioned. A set of recommendations has already been issued by a British Committee and except for small details we find Professor Wintz in agreement with them. In these days of modern x-ray apparatus giving a large output, especially the higher-voltage deep-therapy plants, it is very necessary to have rigid regulations regarding protection, both of operators and patients.

An important section deals with the dangers of film storage. The recent Cleveland disaster is still fresh in the minds of radiologists. We ourselves have had the unpleasant experience of being in a room where during the humid heat of the monsoon spontaneous combustion of films took place. It has been urged by all the protection committees that the nitrate-base film be replaced by the acetate-base. In the latter, when combustion does take place, it is slow and not of the explosive variety associated with the nitrate film. It is to be hoped that makers of films will try to perfect the non-inflammable film. This is particularly necessary in a climate like the one in which many of us work in India.

This booklet should be read by all radiologists. It is sound throughout and deals with all the problems concerned with the thoroughness characteristic of the German. The bibliography alone occupies forty-three pages.

G. G.

CRIMINAL ABORTION.—By L. A. Parry, M.D., B.S., F.R.C.S. London: John Bale, Sons and Danielsson, Ltd., 1932. Pp. 203. Price, 10s. 6d.

THIS volume has come out as a pioneer on the subject of criminal abortion. The contents cover a far wider field than indicated by the title, abortion—natural, justifiable and criminal—having been thoroughly dealt with.

In India the criminal abortionist resorts mostly to drugs administered internally and applied locally. We agree with the author in his view that criminal abortion is on the increase. The provisions of the law, both Indian and English, have been carefully dealt with. The author has also discussed the law of evidence in a certain class of cases. The treatment of the subject has been excellent and affords delightful reading. The question 'Should a doctor be a police informer?' has

been very well answered in this book. There is plenty of material here for the legislator of both sexes to ponder over, particular stress having been laid on the evasion of the law by professional abortionists advertising secret remedies in the public press.

In our opinion this book will be very useful to students and teachers of medical jurisprudence. Practising lawyers and doctors will find valuable references in it.

B. G. M.

A MANUAL OF CLINICAL LABORATORY METHODS.

—By C. L. Cummer, Ph.B., M.D., F.A.C.P. Third Edition. London: Henry Kimpton, 1932. Pp. xx plus 583. Illustrated with 173 engravings and 12 plates. Price, 30s.

In view of the fact that this book is in its third edition it is perhaps not necessary to describe in any detail its scope. It is a little more comprehensive than the usual book of this type, but the author has not chased the chimera of completeness and attempted to deal with subjects on which he has had no experience. Thus, as far as tropical diseases are concerned he has been content to give a detailed and very useful account of the life cycle and methods of identifying the malarial parasite—including a good coloured plate—a very satisfactory account of amoebic dysentery with a slightly less satisfactory plate (here a picture of *Entamoeba coli* for contrast would have been useful), and a few short references to certain other blood and intestinal parasites peculiar to tropical countries. Bacteriological technique has been dealt with rather fully, the formulæ for numerous media and the methods of preparing them being given in detail.

The additions in this edition are not numerous; they include a description of Schilling's modification of the Arneeth count and a table of 'normals', conveniently placed at the end of the book after the index, a better arrangement than usurping the functions of the endpapers for this.

The description of the various methods is always clear and excellent judgment has been used where there is any choice of methods. The impression is always given that the author has first-hand knowledge of the subject about which he is writing and we were unable to find any inaccuracies. With very few exceptions methods which are only of historical interest are omitted and though the book is a large one there is no evidence of padding and there are no unnecessary illustrations; at the same time the book is well illustrated.

Both the clinician and the laboratory worker will find it a very valuable book, in some ways the most complete of its kind. The price is very moderate indeed for a book of its size and quality.

L. E. N.

URINE ANALYSIS.—By Byomkes Das Gupta. Published by Butterworth and Co. (India), Ltd., Calcutta. Pp. 141. (Illustrated.) Price, Rs. 2-8.

THE book is intended for the use of students and junior practitioners. It is written in a clear and simple style and will be a help to guide students in their practical class.

The chemical tests of some of the abnormal constituents of the urine such as albumin, albumoses, glucose, acetone, bile, blood, indican, etc., as well as the quantitative tests for the estimation of urea, chlorides, albumin, and glucose have been given clearly and in some detail.

There are a few points in the book on which the author should have been more explicit. For instance, when describing the method of albumin estimation by Aufrecht albuminometer, he advises centrifugalizing for two or three minutes, without giving any idea of the number of revolutions per minute. The result obviously will vary according to the revolutions which the machine is put to, as well as to the time limit. In appendix I, the author advises 200 (instead of 100)

grammes of anhydrous sodium carbonate in making up the qualitative Benedict's solution; this appears to be a printing mistake. In the table of sugar calculation (page 94), some inaccuracies have crept in which we hope to see corrected in the next edition of the book.

The book is, on the whole, well written and we recommend it to those for whom it is intended.

J. P. B.

ESSENTIALS OF MEDICINE.—By Charles P. Emerson, M.D., and Nellie Gates Brown, R.N. Tenth Edition. London: J. B. Lippincott Company, 1931. Pp. xx plus 592. Illustrated. Obtainable from Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 9-6.

THAT this is the tenth edition of the book shows that it has a well-deserved popularity. This edition gives all of the recent advances in medical science which have been accepted as proven, and the student can accept the teachings with confidence.

On glancing over the 'Preface to the Tenth Edition' one reads on the third line:—'Notes on tularæmia, cresol phosphate neuritis and minor subjects have been added'. Not being familiar with this particular brand of neuritis, the reviewer looked it up in the index. Not a trace of it could be found. Eventually it was tracked down in the text and found to be placed under the heading of Jake paralysis in the last 6 lines of the section on diseases of the nervous system. It was also to be found in the index under this heading. This slang terminology may be a sufficient indication to American students, but it certainly is not very enlightening to the average English or Indian reader. Actually one finds that it is 'a severe type of peripheral neuritis due to tricresolphosphate, a cheap constituent of many varnishes and lacquers, which tastes like ginger and so has been used recently as an adulteration in cheap ginger ale'. Another of the penalties of prohibition!

On making further references to the index one suspects that it has not been revised in this edition. Tuberculosis starts on page 428 not 427 as in the index. Typhus on page 516 not 515. Diabetes mellitus on page 368 not 369, and so on.

The 'English' in parts of the book is of the American type. A typical example of this is found on page 285 in the end paragraph, under the heading 'The treatment of uræmia':—

'Lumbar puncture, and removing, if it is under pressure, considerable of the spinal fluid, will give temporary relief. Such treatment may result in the patient regaining consciousness and immediate danger past; further treatment is that of any case of severe Bright's diseases'. Comment is unnecessary.

The book as a whole is excellent and the subject-matter is written in a simple and interesting way that holds one's attention. Third- and fourth-year medical students could read the book with advantage as all the essential points of a disease are presented clearly and concisely without being tied up in masses of infinite detail. The outlook is essentially clinical which again is a very important factor in maintaining the interest of nurses and of beginners in the art of medicine.

The book covers a very wide field including tropical medicine and there is a chapter on the psychoneuroses. Most tropical diseases are dealt with quite accurately and satisfactorily, but kala-azar, which is dismissed in 9 lines, is the exception. The large spleen is mentioned among the symptoms but not the large liver; and the statement that 'about one-third of those infected die' may have been true some years ago, but since the advent of the pentavalent antimony preparations the mortality rate is now as low as two per cent.

In a text-book of 592 pages it would indeed be strange if no points were found to criticise. The above criticisms are but very minor details that could be altered with advantage in an extremely good and interesting text-book, which is ideal for its purpose as a nursing manual.

At Rs. 9-6 it is good value.

J. F. C.

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the recognition and grouping of tropical fevers of unknown aetiology. When every possible diagnostic method has failed to determine the nature of a fever, pyrexia of uncertain origin remains as the only diagnosis, and so long as the term is employed with a signification purged from all ambiguity, it is infinitely preferable to any fanciful alternative that might take its place. But it must be recognized at the same time that to label any case as pyrexia of uncertain origin which has not been thoroughly investigated by every means available is culpable negligence.

Sandfly fever was reduced in Malta and increased in India—the increase in India being due to operations in the Peshawar district. The lesser degree of incidence in 'salted' troops, both British and India is marked.

Veneral diseases.—6,146 admissions were recorded (34.5 per 1,000). This is a slight decrease on 1929. Gonorrhoea is the most prevalent, the admissions being four or five times as great as for syphilis and soft chancre. The China station heads the list for admissions—140.7 per 1,000. India is 61.6; the home stations being very much lower, about 20 per 1,000.

As regards *dengue* the report states that the admissions from this disease seem to be under-estimated. In India sandfly fever is often diagnosed when in reality the disease is probably dengue.

Cysticercosis as a cause of epilepsy is noted. Two such cases are reported.

Diseases of the middle ear are important—much more attention is now being paid to careful examinations of the ear at the time of recruitment.

Tonsillitis was responsible for more admissions than any other disease with the exception of malaria.

The opportunities now afforded in the Army Medical Services for specialisation are being fully taken advantage of.

Under medicine, interesting investigations under malaria are recorded. Treatment of benign tertian malaria with quinine 10 grains and 0.02 gramme plasmoquine twice a day for 21 days gave good results. In malignant malaria, quinine for 14 days and then quinine plus plasmoquine (0.04 gramme) for 5 days before discharge was given. As regards relapses, the results were distinctly superior to previous methods.

A very high standard of surgery was maintained.

There are several interesting paragraphs relating to general sanitation, accommodation in barracks and in the field, ventilation, roofing materials, water supplies, etc. Chloramine is now being prepared by using electrolytic sodium hypochlorite and ammonium salts. Succin-chloramide was found to be stable under most conditions. 'Dress reform' has penetrated the army, and suggestions have been made for a jacket with a turned down collar and trousers of the nature of 'plus fours'.

Interesting research work on the antigenic response to 'rough' and 'smooth' variants of micro-organisms was carried out. High lethal temperatures reduce the antigenic power.

Several points of peculiar interest to Indian conditions are noted. Wilson and Blair's medium for isolating *B. typhosus* gave apparently little success. The average Indian case of typhoid is more severe clinically than the British case. Para 'A' is much commoner than para 'B' in India, and cases of para 'C' were diagnosed. There has been a steady rise in the incidence of typhoid in Indian troops for the last few years. This is due to the increased use of and facilities for laboratory investigation. The benefit of inoculation is shown by the small number of cases and the smaller case mortality amongst the inoculated.

Much of the 'diarrhoea' in India is due to infections with *B. dysenteriae* (Flexner and Shiga). The cellular exudate of bacillary dysentery is definitely pathognomonic. 65 per cent. of 'dysentery' was bacillary in origin, 14.6 protozoal and in 20.4 per cent. the actual cause was not demonstrated. Flexner's bacillus is the main source of dysentery, but in a few stations like Ranikhet, Shiga's bacillus appears to be commoner.

It is stated that the percentage of amebiasis amongst the menial population of India is probably not less than 10. Such carriers however do not appear to do the harm that they might.

Malaria.—The experimental treatment with quinine and plasmoquine has already been noted. Equally good results seem to be obtained with 0.03 gramme of plasmoquine as with 0.04 gramme.

An important move in the right direction has been to give anti-malarial officers a definite tenure of appointment in the most important stations.

A spray of carbon tetrachloride 1 per cent., oil of wintergreen 2 per cent., kerosene oil 97 per cent., and 1/4 pound of naphthalene to every gallon gave only fairly satisfactory results, as many anopheles seemed to be only stupefied.

The interesting fact is noted that the caloric value of Indian beef is lower than that of frozen Argentine beef.

The whole report makes interesting reading and should receive a wide circulation.

SIXTY-NINTH ANNUAL REPORT OF THE GOVERNMENT CINCHONA PLANTATIONS AND FACTORY IN BENGAL, FOR THE YEAR 1930-31. CALCUTTA, BENGAL SECRETARIAT BOOK DEPOT. PRICE, ANNAS 13.

THIS annual report is always of interest to the medical profession in India. The report for 1930-31 is written by Mr. G. E. Shaw, officiating Superintendent, Cinchona Cultivation in Bengal, who had taken over from Mr. C. C. Calder after the end of the year. Mr. Calder was in charge during the year. An interesting feature of the report is that Mr. Shaw comments on the introduction of new synthetic drugs in malaria therapy and the future possibility of the replacement of quinine by Plasmoquin and Atebrin. A second point is the necessity for the medical profession in this country to realise that, for benign tertian and quartan malaria at least, treatment by cinchona febrifuge is as efficacious as, and very much cheaper than, treatment by purified quinine sulphate.

The following are abstracts from the reports:—

General.—In last year's report it was pointed out that the price of quinine had remained steady in spite of general depression and the reasons for the strength of the industry were given at length. For yet another year the price has remained stationary, and there is no sign of any coming reduction, though the price of nearly every other chemical product has declined still further. It is in fact quite possible that the present price will continue till the effect of competition by synthetical products is felt, and this, though most certainly coming in the distant future, is as yet only heralded by the tentative trials of Plasmoquin, which, however, though handicapped by its somewhat poisonous properties, is steadily winning its way to favour even if its use is at present usually supplemented by that of quinine. This oncoming competition is still too far off to affect the value of our large stocks of quinine (89,000 lbs. belonging to the Bengal Government and 305,500 lbs. belonging to the Indian Government).

The total consumption of quinine in India is keeping remarkably steady too at about 211,000 lbs. per annum, but this cannot be correlated with the steady price, for by looking backwards it can be seen that the consumption has not varied with either price or the condition of public health but with trade prosperity. The average population of India does not buy quinine, the people are not yet educated up to it, nor can they afford it, but when labour is in demand by large firms and trading agents, then large purchases of quinine are made to keep their labour forces at work. Neither this nor the wholly commendable missionary enterprise nor even the work of Public Health Departments however goes far towards satisfying the huge potential demand in India for quinine.

Two committees have been discussing some aspects of this problem during the year, the Malaria Commission

of the League of Nations and the Drugs Enquiry Committee. And so far there has been no sequel to the report of the Agricultural Commission on the extension of cinchona cultivation. The thorny problem of how to utilise our accumulated stocks of quinine has still to be tackled.

An outstanding feature of the year has been the celebration of the tercentenary of the discovery of cinchona bark as a remedy. An exhibition organised by Dr. Wellcome at the Wellcome Historical Medical Museum in London was opened on 8th December with specimens illustrating the entire history of the bark, beginning with a case brought from Peru to Spain in 1777 and lent by His Majesty the King of Spain. Books and manuscripts went back to still earlier times, one page of a doctor's case book, referring to cinchona, being dated 1656. The Secretary of State for India lent among other papers a volume of the original correspondence in connection with the introduction of cinchona into India. Addresses were given by prominent men including among others Sir David Prain, who was at one time in charge of the cinchona cultivation in Bengal. Some legends of the original discovery of the bark were severely criticised, the findings of the Royal Commission on Agriculture stressed, and the extended use of the subsidiary alkaloids of the bark advocated.

With regard to the last point there is a general consensus of medical opinion that the mixture of the alkaloids is very little inferior to quinine as a febrifuge, but it still remains the custom to give quinine although the present price of the mixture is only one-half that of the separated quinine. Practically all the subsidiary alkaloids obtained at the Quinine Factory are now made up into the mixture with quinine called 'cinchona febrifuge' but sales are not quite keeping pace with manufacture and we have over a year's supply in hand.

Extensions, acreages and crops.—(a) *Mungpoo.*—Rainfall was low, varying from 99.29 on Mungpoo to 139.36 on Sittong, a serious drought having existed during the whole of the cold season from November to March. As a consequence there were many casualties in the young cinchona blocks, only the strongest plants being able to withstand it, and more than half the plants from the nurseries were required for filling vacancies. Another consequence of the prolonged drought is the widespread and abundant flowering of the older blocks. These, however, in other respects have quite recovered and are all doing well. So are those of last year's plants which did not actually succumb. It is hardly possible now to see the effects. That the majority of the plants withstood the drought so well is due in no small measure to persistent hoeing which maintained a good surface tilth and prevented excessive evaporation from the subsoil.

New blocks put out amounted to 101 acres for which 235,722 young plants were required. It has been noticed by the Manager in Mungpoo that the cinchona nursery disease is never found in new nursery lines and this year's work again supports his generalisation. In newly opened field nurseries both in Labdah and Rungbee there was not a single diseased plant, whereas in a four-year-old field nursery in Mungpoo planted with seedlings taken from the same seed-beds disease was rampant although the precaution had been taken of completely changing the top layer of leaf soil in the beds. Another interesting experiment in this connection was carried out in Sittong, where an old field nursery, which had previously been infested with disease, was reopened after lying fallow for a matter of five years and planted with seedlings of Ledger and Succirubra from the seed-beds of both Mungpoo and Munsong. There was no trace of disease visible in the plants after growing in this nursery from July to May. It would, therefore, be advisable not to use a field nursery for more than two seasons and a change of seed-lines occasionally would also be beneficial.

The acreage cut out was 85.6 so that there is a net increase for the year of 15.4 acres. The harvest obtained

was 375,971 lbs. dry bark. The average age of all barks cut out is 9.6 years and the average annual increment 457 lbs. Coppiced blocks are again doing well. There cannot now be the least doubt but that if a block is still pretty well filled coppicing pays far better than up-rooting the whole plant. It is noticeable too that on most of the blocks that have been reafforested in recent years the forest trees are putting on remarkably good growth. In fact, it is becoming obvious that the better cultivation carried on nowadays with the sowing of leguminous plants and the digging in of green manure must modify our earlier opinion as to the absolute necessity of alternate ten-year periods of cinchona and forest. When coppiced plants flourish there is every reason to believe that seedlings would also do so and already where gaps between the coppiced plants have been filled in the seedlings are really keeping up with the coppiced shoots.

The Pusa Mycologist visited the Plantations during the year and carried out a series of inoculations with the object of securing more data regarding the life history of the disease, and a few plants that died soon after inoculation were uprooted and sent to Pusa for examination.

Other medicinal plants.—Five hundred and ten pounds of dry root of ipecacuanha were collected during the year. A healthy young stock of several thousand plants has been raised from seed and cuttings, and planted out in the specially prepared and sheltered beds. The cultivation of digitalis was abandoned this year as there were no advance orders and we have no proper arrangements for storing the leaf in a dry enough state to prevent deterioration.

(b) *Munsong.*—Rainfall for the year was 88.13 inches, 14 under normal and as in Mungpoo the youngest blocks have suffered from the cold weather drought. Some damage was done in Burmiak division by hail, leaves and even bark being stripped from the trees in one or two of the blocks. But roads have not suffered this year. Temperatures were normal with no specially marked variations.

As was pointed out last year the only land now available for planting is the vacant space in existing blocks. In these vacancies shade trees are already established. The ground was well trenched and the green jungle buried for manure; plants were then put out 4 feet by 3 for 9 inches which is rather closer than earlier custom. So far this replanting of empty spaces promises to be successful. The 1930-31 trials are doing well though much work is required to cope with the thatch grass which had taken possession in some of the areas.

Except when vacancies caused by the drought had to be filled in, the whole plantation has done well this year; these vacancies, as would be expected, occurred mostly in the stony soil of the Munsong division.

Nursery disease was less noticeable this year, certainly less than 10 per cent. of the nursery stock was affected and the late sowing with early removal from the nurseries is doubtless improving matters. Replanting amounted to 19.2 acres, all of Ledger, 15.2 acres at Kashyem and 4 at Burmiak. In all something over 90,000 plants were put out. Harvests were by far the heaviest yet recorded, a total of 1,100,083 lbs. for the year.

(c) *Plantations as a whole.*—The total area under cinchona is 2,657.91 acres, calculated as carrying a full complement of cinchona trees. The total harvest was 1,476,054 lbs. of bark.

Factory work.—Besides 59,052 lbs. Java bark and 111,121 lbs. Burma bark producing 5,959 lbs. of quinine sulphate and 3,266 lbs. of cinchona febrifuge for the Government of India, 163,748½ lbs. Mungpoo and 820,032½ lbs. Munsong bark were worked up to produce 26,029 lbs. quinine sulphate, 2,826 lbs. and 76,861 boxes quinine tablets containing, between them, 11,040 lbs. quinine sulphate, 609 lbs. other quinine salts, 13,451 lbs. cinchona febrifuge powder and 3,502 lbs. cinchona febrifuge in tablet form.

The Mungpoo bark had an average quinine percentage of 3.78 and the Munsong 4.01.

All the quinine sulphate was stored in a half purified state, the stock of fully purified quinine in tins being still very high, 151,833 lbs.

The amount of bark extracted, 1,153,954 lbs., has only once been exceeded in any one year but owing to the poor quality of this bark the amount of quinine produced is far below our record.

Six hundred and forty-eight samples of bark were analysed for the plantations.

Cost and value of quinine produced.—(a) *Cost in the bark.*—Not counting the 2,424 lbs. of quinine passing through into the febrifuge, 26,029 lbs. crude quinine sulphate, 11,040 lbs. sulphate in tablets and the equivalent of 674 lbs. in other salts a total of 37,743 lbs. were contained in 933,781 lbs. mixed Munsong and Mungpoo barks, costing at 2.7 and 3.6 annas, a total of Rs. 175,223.14. The cost per pound of quinine in the bark was, therefore, Rs. 4.64.

(b) *Cost of extraction, packing and delivery to railway.*—No advance on the figure of Rs. 2,721 for cost of extraction has been made. It has been used as a basis for charges to India and it is not proposed to change it for the present.

(c) *Total cost per pound and value.*—This is made up of the cost of the bark Rs. 4.64 and cost of extraction Rs. 2,721 a total of Rs. 7.36. The wholesale rate being Rs. 18 per pound, the 37,743 lbs. quinine extracted in all forms as above defined are worth Rs. 6,79,374 but cost only Rs. 2,77,826.

Sales and selling rates.—No change has taken place in the selling rates since the last report was written.

The total sales of all kinds, cash and credit, and including Rs. 1,872 received direct by the Department for miscellaneous products, amounted to Rs. 6,27,228. Of this Rs. 2,44,504 were by sales of quinine tablets.

Expenditure and receipts.—The total expenditure of the department including pensionary charges was Rs. 4,08,433. Total receipts exclusive of Rs. 4,923 from land rent, grazing fees, etc., paid to the Treasury not to the credit of the Cinchona Department, but inclusive of Rs. 1,872 received direct from miscellaneous products, etc., were Rs. 6,27,228. Of this amount a sum of Rs. 31,515 is deducted for credit to the Jails Department for distribution of products, leaving a balance of Rs. 5,95,713 for entry in the profit and loss valuation account.

Quinine reserve and stock account.—The provincial reserve of quinine, the great mass of which lies in the crude state, was 89,762 lbs. at the end of the year. This is 16,239 lbs. up on the opening balance.

The stock of dry plantation bark opened at 753,504 lbs. and closed 472,973 lbs. up at 1,226,477 lbs.

Profit and loss valuation.—There is a valuation profit balance of Rs. 2,84,667, a result that may be considered all the more satisfactory when trade depression with diminished purchasing power has been so evident during the year.

THE MISSION TO LEPERS. REPORT ON THE FIFTY-SEVENTH YEAR'S WORK IN INDIA, 1930-31.

PROFUSELY illustrated and well written, this report will interest all leprosy workers in India. The photographs alone form an interesting study; leper scouts in a gymnastic display, a group of the leper girl guides company at Cuttack, operating theatres and hospital wards built by leper labour, travelling roadside clinics, healthy children in the homes for healthy children of lepers, and leper boy scouts engaged in anti-malaria work. Instead of the old-time conception of leprosy as a ravaging and very infectious disease, we have here the modern conception of it as a self-limited and only sometimes infectious disease, especially amenable to treatment by fresh air, suitable diet, exercise, and the treatment of secondary and complicating infections.

The introductory section deals with general figures. At the end of 1930 there were 6,047 sufferers from leprosy in the Mission's Homes in India and Burma, and in addition 1,424 inmates in leper homes aided by the Mission, but for which it is not responsible. There were 781 children of lepers, free from the disease, separately provided for. The total expenditure for the year was Rs. 8,36,638, of which sum Rs. 4,56,519 was subscribed by voluntary contributions, the balance of Rs. 3,80,119 being received from public bodies, chiefly provincial governments.

New buildings completed during the year included hospital buildings at Chandkuri, C. P.; a new hospital ward for women with combined leprosy and tuberculosis at Purulia, Bihar; a home for healthy children of lepers at Vadathorasalur, Madras; church buildings at Moulmein, Burma, and Knodwa, near Poona; a doctor's residence, new dispensary, and treatment block at Poladpur, Bombay; a laboratory at Subathu, Simla Hills; and additional accommodation for further patients at Purulia and Manamadura.

Of the 4,699 inmates under treatment during 1930, a total of 3,127 cases improved in varying degree; 325 became symptom-free (or 'quiescent', to use the term suggested by the Manila Conference), and of these 242 were discharged during the year. 'Faith, oil and work, but the greatest of these is work' comments the report. 'Certainly all three factors have their essential place, and the value of occupational therapy is being increasingly stressed.'

The second section of the report deals with the different institutions in the various provinces in India. At Purulia there is accommodation for 757 inmates, but the Rev. E. B. Sharpe remarks, 'We hadn't any room last month, and we've less now'. Forty-three patients became symptom-free during the year, and 70 cases of mixed type became bacteriologically negative. At Miraj 170 inmates were housed in accommodation intended only for 129. At Nasik Miss Harvey comments on the value of rescue work among untainted children, they are trained as carpenters, domestic servants, tailors, railway workers, etc., and are able to earn a livelihood when discharged. At Chandkuri vegetable gardening is an important industry, and provides a large output of fresh vegetables; at Dhamtari brick-making is carried out. At Manamadura 298 patients had to be housed in accommodation intended for only 252; here during the year 26 medical men, 11 district health officers, 41 sanitary inspectors, and one district leprosy officer were trained. Tomato growing is a special industry at this Home. At Moulmein a leper quartette was established, the singers being respectively a Burman, a Sgaw Karen, a Chin, and a European—all lepers. At Nanyoor a separate colony is being built for early cases, with facilities for occupational therapy as well as treatment.

The final section of the report is one on medical treatment by Dr. R. G. Cochrane, General Secretary of the British Empire Leprosy Relief Association. Here three points are stressed; with better technique and intradermal infiltration of lesions 'the modern methods in the treatment of leprosy will bring a greater number of cases to a state of health'; secondly, leprosy has now come within the scope of preventive medicine; thirdly, a balance must be preserved between out-patient and in-patient work. The infective leper, wherever possible, should be isolated in a hospital or colony; first because unless segregated he is a danger to the community; secondly, because the treatment takes such a long time to show definite results, that as an out-patient he is very liable to become discouraged and to stop coming to the dispensary; and lastly, because it is only in a hospital or colony that you can show him what can be done. Segregation should be voluntary and not compulsory. Finally, the in-patient hospital or colony should be combined with a comprehensive out-patient scheme for the treatment of those cases which need not be segregated, or who cannot avail themselves of hospital care.

Correspondence

SODIUM THIOSULPHATE IN MERCURIAL POISONING

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In your issue for last November, p. 641, in the abstract from Dr. Johnstone's article on acute mercurial poisoning, it is stated that 'we use sodium thiosulphate both by mouth and intravenously. Its intravenous use has not proved valuable in experimental animals, although it has been shown to be harmless..... Certain writers consider it of value in poisoning by mercury. We shall continue to use it until a more specific antidote is discovered'.

That sodium thiosulphate is efficacious in mercurial stomatitis is illustrated by the following case:—

A few days ago a patient came to me complaining of soreness of the mouth and itching all over the body. He stated that he had been given a white powder as a purgative by a *vaidya* . His gums were swollen and soft; there was profuse salivation, and the breath was foul. There was itching all over the body and in the gums as well. No constitutional disease could be discovered to account for his trouble. Evidently the case was one of mercurial stomatitis, and the white powder was probably calomel.

Astringent gargles and magnesium sulphate by the mouth were of no effect. An intravenous injection of sodium thiosulphate gr. xii reduced his trouble by one-half. Two days later a second similar injection completed his cure.

On two previous occasions I have used sodium thiosulphate intravenously in the treatment of tissue reactions due to leakage of neosalvarsan during its intravenous administration.—Yours, etc.,

BALKRISHNA N. MEHTA, M.B., B.S.

I/C JUNASINGJI DISPENSARY,

BHAVNAGAR,

17th January, 1932.

THE USE OF MUSTARD IN PNEUMONIA

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In the January 1932 issue of the *Gazette*, on p. 27 in an article on the use of mustard in pneumonia, the writer has elaborately enumerated its use in various affections where it is undoubtedly of value; but the value of the external use of mustard—as a poultice or plaster—in pneumonia is very questionable. It is applied with the intention of 'increasing the flow of blood, relieving congestion, and removing the accumulation of pus, blood, etc.'

Considering the transitory counter-irritant action of mustard, it cannot exercise any durable effect on the long-continued pathological process in pneumonia, and we cannot always repeat it; as the application is attended with pain. Anyone who has been subjected to a mustard plaster round the chest does not easily forget it. Are we justified in using this remedy with its doubtful effect and its unquestionable pain? Such applications in pneumonia have been condemned by many, and the eminent physician Dr. H. A. Hare in his *Therapeutics*, p. 867, writes as follows: 'How anyone can see a hepatized lung and then think that those remnants of barbarism—cotton-jackets and poultices to the chest—can do anything but harm to the patient I cannot understand. Why should we poultice the chest in pneumonia any more than we would paint the abdomen with silver nitrate to treat the intestinal ulcers in typhoid fever?'

Further, with regard to the much lauded reflex stimulation of the heart by mustard this much can be said; that if there is any such effect it is also transient and procured at the cost of a painful procedure. Such

effect is especially insignificant when we have a long list of reliable stimulants in the *British Pharmacopœia*.—Yours, etc.,

SATYA KINKOR BISWAS, L.M.P.
KIRKEND P. O., KUSUNDA, MANBHUM,
JHARIA COAL FIELD,
27th February, 1932.

THE 'OS NAVICULARE PEDIS'

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—The 'os naviculare manus'* and the 'os naviculare pedis'* are two bones in the human body serving homologous functions and having analogous positions; the term 'navicular' being common to both, confusion is possible. Generally the prefix and suffix of the 'naviculare' are omitted, the adjuncts of distinction being dispensed with, and the bone being called the 'navicular bone' for all theoretical and practical purposes.

As the name implies 'navicular' means boat-shaped. In the case of the navicular bone of the carpus there is no doubt a fanciful resemblance to a boat in shape and structure*, and the nomenclature is therefore correct and quite justifiable; but in the case of the tarsus, the bone has absolutely no resemblance to, nor any point of similarity to, a boat or ship; and yet it is termed the navicular bone. To my mind it would seem that this vagueness and want of precision should be remedied in the right manner.

Further, confusion arises sometimes when one says 'the navicular bone'; which is it?—the one in the carpus or in the tarsus? In an examination, if short notes on the navicular bone are asked for, should the answer refer to one or both? In *Gray's Anatomy*—24th edition, edited by Johnstone, p. 374—the navicular bone of the tarsus is called (Os naviculare pedis), in brackets of course. In the 8th and latest edition of *Cunningham's Manual of Practical Anatomy*, revised by Arthur Robinson, the bone in question is called by the same name.

To remove all ambiguity and to be precise, I would suggest a new name instead of the 'os naviculare pedis'. Since the bone in question articulates with four bones it might be termed *quadri-articulate*, or, as it has four articular facets, it might usefully be termed the *os quadrato-tarsus*, which to my mind appears to be the most suitable name. The name 'navicular' should by all means be retained for the bone in the carpus, but the bone in the tarsus requires re-naming from the scientific, anatomical and reasonable points of view. According to modern, simple terminology and precise phraseology '*quadrato-tarsus*' appears to be self-explanatory, and self-consistent with due meaning and precision.—Yours, etc.,

M. N. KRISHNAMURTHY.

CHAMARAJPURAM, MYSORE,
13th January, 1932.

THE DOSAGE OF INTRAVENOUS MERCUROCHROME

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In the *Gazette* of March 1932 there is an article by Rao and Roy on the use of mercurochrome intravenously. The dosages of the drug reported are most confusing and even dangerous. Probably this has been pointed out to you already, but I think that a correction is necessary.

It is stated on page 125 that the dose is 0.375 grammes per kilogramme of body weight. This, if given, would undoubtedly kill the patient. There is the saving clause following which says that this corresponds to 17 c.cm.

* *Gray's Anatomy*, 24th edition, pp. 332, 374, 375.
Cunningham's Manual of Practical Anatomy, 8th edition, pp. 210, 214, 215.



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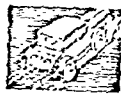
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of 1 per cent. solution per 100 lbs. of body weight. This latter statement is followed out in the case reports given, but I think that there is a grave danger in the statement. This confusion is not relieved in the least when on page 128 in the conclusion it is stated that the dosage is variously 0.5 milligrammes or 0.375 milligrammes per kilogramme of body weight. 17 c.cm. of 1 per cent. solution contains 170 mgms. of drug. Calculating from the figure 0.375 milligrammes per kilogramme of body weight the dosage would be 17.04375 mgms. Apparently these figures should read 5.0 and 3.75 mgms. per kilo of body weight.

Before coming to India I used this drug intravenously with the dosage of 0.5 c.cm. of 1 per cent. solution for every 10 lbs. of body weight often with great effect. This dosage is considerably less than what these gentlemen report. I should be glad to know and I am sure many others also would be glad to know what the correct dose is.—Yours, etc.,

H. L. ELLIOT, B.A., M.D., C.M.

GOOD SAMARITAN HOSPITAL,
CHICACOLE, GANJAM,
22nd March, 1932.

Service Notes

APPOINTMENTS AND TRANSFERS

IN pursuance of the provisions of sub-rule (2) of rule 26 of the Council of State Electoral Rules, the Governor-General is pleased to nominate Major-General J. W. D. Megaw, C.I.E., being an official, to be a Member of the said Council of State.

Major-General J. D. Graham, C.B., C.I.E., K.H.S., Public Health Commissioner with the Government of India, is appointed to officiate as Director-General, Indian Medical Service, during the leave granted to the Hon'ble Major-General J. W. D. Megaw.

Lieutenant-Colonel A. J. H. Russell, C.B.E., Director of Public Health, Madras, at present on leave, is appointed to officiate, until further orders, as Public Health Commissioner with the Government of India, with effect from the date that Major-General J. D. Graham is appointed to officiate as Director-General, Indian Medical Service.

Lieutenant-Colonel M. S. Irani, Superintendent, Matheran, is appointed to officiate as Surgeon-General with the Government of Bombay, during the leave granted to Major-General W. C. H. Forster.

The services of Lieutenant-Colonel D. P. Gail, Principal, Medical College, Calcutta, and Superintendent, Medical College Hospitals, are placed at the disposal of the Government of India, with effect from the 1st April or subsequent date on which he is relieved.

Lieutenant-Colonel T. C. Boyd, Chemical Examiner to the Government of Bengal, and Professor of Chemistry, Medical College, Calcutta, is appointed as Principal, Medical College, and Superintendent of the Medical College Hospitals, Calcutta, with effect from the date on which he takes over charge, *vice* Lieutenant-Colonel D. P. Gail.

Major H. Williamson, O.B.E., an officiating Agency Surgeon, on return from leave, is posted as Civil Surgeon, Quetta, with effect from the 6th February, 1932.

On return from leave Major W. J. Webster, M.C., is appointed as supernumerary officer at the Haffkine Institute, Bombay, with effect from the 19th February, 1932, until further orders.

Major S. D. S. Greval, an officer of the Medical Research Department, is appointed to officiate as Director, Pasteur Institute of India, Kasauli, *vice* Lieutenant-Colonel H. E. Shortt, granted leave.

Major S. R. Prall is appointed to officiate as Civil Surgeon and Superintendent, B. J. Medical School, Poona, *vice* Lieutenant-Colonel R. F. Steel, granted leave.

Captain J. C. Drummond, on supernumerary duty at the Medical College Hospitals, Calcutta, is appointed as Civil Surgeon, Midnapore, with effect from the forenoon of the 19th February, 1932.

Captain J. F. Shepherd is appointed temporarily to officiate as Agency Surgeon, and is posted as Medical Officer and *ex-officio* vice-Consul, Sistan, with effect from the 25th December, 1931, and until further orders.

To be Captain

Captain George Constantine Phipps, from R. A. M. C. to the Indian Medical Service. Dated 21st December, 1931, with seniority 30th July, 1927.

To be Captains (on probation)

Captain R. A. Wesson, 2nd February, 1932, with seniority 30th October, 1926.

W. Happer, 2nd February, 1932.

J. J. Quinlan, 2nd February, 1932.

To be Lieutenants (on probation)

R. J. Jarvie, 2nd February, 1932, with seniority 2nd February, 1931.

F. A. B. Sheppard, 2nd February, 1932, with seniority 2nd February, 1931.

P. E. Sweeney, 2nd February, 1932.

M. Sendak, 2nd February, 1932.

W. A. Noel Marrow, 2nd February, 1932.

LEAVE

The Hon'ble Major-General J. W. D. Megaw, C.I.E., K.H.P., Director-General, Indian Medical Service, is granted leave on average pay for 2 months and 8 days combined with leave on half average pay for 1 month and 12 days, with effect from the 23rd March, 1932, or subsequent date from which he may avail himself of it.

Major-General W. C. H. Forster, V.H.S., Surgeon-General with the Government of Bombay, is granted leave on average pay for 4 months and 6 days combined with leave on half average pay for 1 month and 22 days, with effect from the 12th March, 1932, or subsequent date from which he may avail himself of it.

Lieutenant-Colonel H. E. Shortt, Director, Pasteur Institute of India, Kasauli, is granted leave on average pay for 7 months and 24 days, combined with leave on half average pay for 7 days, with effect from the 1st March, 1932, or subsequent date from which he may avail himself of it.

Lieutenant-Colonel R. F. Steel, Civil Surgeon, and Superintendent, B. J. Medical School, Poona, is granted leave on average pay for 18 days followed by leave on half average pay up to and inclusive of the 27th April, 1932, with effect from the forenoon of 19th February, 1932.

Lieutenant-Colonel P. F. Gow, D.S.O., Second Professor of Midwifery and Gynaecology, Medical College, Calcutta, is allowed leave for 6 months, with effect from the 6th April, 1932, or the date of availing.

Major J. Rodger, M.C., an Agency Surgeon, is granted leave on average pay for 8 months, combined with leave on half average pay for 4 months, with effect from the 16th November, 1931, with permission to draw study leave allowance for 6 months while on leave on average pay.

Captain G. F. Taylor, an officiating Agency Surgeon, is granted leave on average pay for 5 days, combined with furlough for 2 months and 21 days, with effect from the 25th December, 1931.

PROMOTIONS

The promotion of Lieutenant-Colonel L. H. Khan to the rank of Major and of Lieutenant-Colonel is ante-dated to the 30th January, 1922, and 30th January, 1930, respectively.

Captains to be Major

R. N. Bhandari. Dated 25th February, 1932.

A. J. C. Culhane. Dated 10th March, 1932.

Note.—The seniority of the undermentioned officers is ante-dated to the dates specified:—

Lieutenant S. Lal. Dated 10th February, 1928.

Lieutenant B. L. Taneja. Dated 19th November, 1929.

Notes

A MODIFIED THOMAS' HIP SPLINT

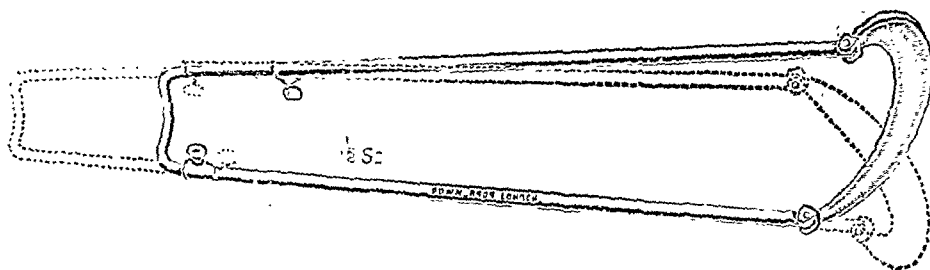
By H. E. RAWLENCE, M.D., F.R.C.S.

Southampton

This splint is based in all particulars upon the principles of a Thomas' hip splint.

Its packs flat for use in an ambulance.

It has a swivel joint on either bar below the buttock half circle. This allows for the splint being used for the right or left lower extremity as required.



The anterior half circle being removed allows of application with ease and without pain.

The splint is intended for temporary use in motor accidents, and for moving patients by road.

'THEELIN', PARKE, DAVIS & CO.

'THEELIN' is an ovarian preparation for intramuscular injection in cases of ovarian and allied disorders. The following are notes on this new preparation by Messrs. Parke, Davis and Co.:—

'Theelin' is the ovarian follicular hormone in pure crystalline form. The ovarian follicular hormone has been demonstrated in the follicular fluid of the ovaries, in the placenta, in the amniotic fluid, and in the blood and urine of certain animals and women. The isolation of 'Theelin' is a most noteworthy step in the development of our knowledge of ovarian physiology and ovarian organotherapy. The credit for this achievement belongs to Dr. E. A. Doisy, Professor of Biochemistry at St. Louis University.

'Theelin' is manufactured and distributed solely by Parke, Davis and Co. under license from St. Louis University, and each lot of the product is tested and approved by the Biochemical Laboratory of St. Louis University before being released for sale.

One of the striking advantages that 'Theelin' offers the clinician is freedom from certain side-reactions that may be caused by the impurities that are present in varying amounts in the crude ovarian and follicular products. Its chief clinical advantage, perhaps, lies in its adaptability to use in adequate dosage. The disappointments that have so frequently followed the use of follicular preparations are undoubtedly attributable in considerable measure to their relatively small content of active hormone. One milligram of pure crystalline 'Theelin' has a potency of at least 3,000 Doisy rat units.

Standardization.—'Theelin' is standardized according to the Doisy method (modification of Allen-Doisy procedure), its potency being expressed in terms of rat units. A rat unit is the amount of hormone necessary to induce oestrus with cornification, as judged by vaginal smears, in an ovariectomized sexually mature rat. For physiologic reasons three injections are given, at intervals of four hours. Many rats are used in each assay and 20 rats are used with each dilution. The smallest quantity of 'Theelin' with which a positive response is obtained in 75 per cent. of the animals is considered as representing one rat unit.

Therapeutic indications.—Parke-Davis 'Theelin' has been subjected to clinical trial in a great variety of conditions characterized by disturbance of uterine or ovarian function following the lines suggested by the fact that the ovarian follicular hormone is produced in great abundance during the early months of pregnancy and may therefore be regarded as supplying a much needed stimulus to the reproduction system. As a result of this investigation it has been learned that 'Theelin' is of particular value in disorders due to the natural menopause—vasomotor disturbances evidenced by headache, hot flushes, insomnia, emotional instability, etc. 'Theelin' in these cases has a prompt and decided effect in restoring the physiologic balance. Similar results are

obtained in cases of surgical menopause, though not always to the same extent or with the same dramatic promptness.

A related condition is functional amenorrhœa, either primary or secondary. 'Theelin' has proved very satisfactory in both types, but especially in the secondary type, some incidental derangement having interfered with the regularity of the periods. In other words, it is in functional amenorrhœa that 'Theelin' is most effective.

'Theelin' is supplied in ampoules, each containing 1 c.cm. of aqueous solution (50 Doisy rat units in each c.cm.). Boxes of six ampoules.

Also supplied in boxes of six vaginal suppositories, each suppository containing 50 rat units.

Literature available from Parke, Davis and Co., P. O. Box 88, Bombay.

LIVOGEN, B. D. H.

LIVOGEN, prepared by the British Drug Houses, Ltd., is stated to be a combination of liver extract with vitamin B and hæmoglobin. It contains the therapeutic principles of liver which are effective in the treatment of the anæmias, together with added measured amounts of vitamins B₁ and B₂, and a measured amount of hæmoglobin. The preparation is therefore indicated in all conditions of 'debility' in which the administration of a blood-regenerating tonic is indicated; it is particularly valuable as a vitalizing tonic after illness, and is specially suitable in private practice.

Livogen is a palatable liquid which may be taken plain, or diluted with water. The average daily dose is one ounce, which may be taken in a single draught, or in divided doses during the day. It is issued in bottles of 4 fluid ozs.

LACTOGEN

The use of dried milks is rapidly on the increase, especially in the tropics where fresh cow's milk is often of very doubtful purity, and sometimes a source of disease. Dr. Robert Hutchison remarks 'I am of the opinion that no inconsiderable part of the decline in deaths from infantile diarrhœa which has happily taken place in recent years is due to the ever-increasing use of dried milk'. The advantages of dried milk are briefly constancy in composition, digestibility, purity, portability, keeping qualities, and ease in preparation. Dr. Eric Pritchard comments on the absurdity of

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- DIPHTHERIA ANTITOXIN:** Anti-diphtheric serum of high potency for prophylaxis and cure.
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SERUM:** Polyvalent-antitoxic-bactericidal serum of high potency for the treatment of streptococcal infections of varied strains.
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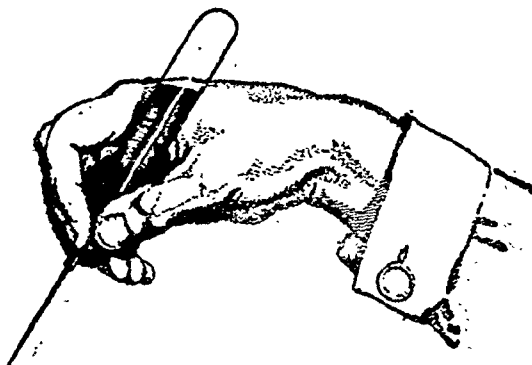
All prophylactic and therapeutic sera in pure and concentrated form are available in

‘SERULE’

For single injection of serum.
A combination of ampoule and sterile syringe, in one instrument.

Advantages :—

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- (3) Simple manipulation



Literature and full particulars on application :

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Ephetonin replaces adrenalin in the treatment of *Bronchial Asthma, Hay-fever, Hypotonia, Urticaria* and other allergic conditions; it also completely supersedes adrenalin by reason of its *oral* administration.

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Ephetonin 0.03 gm.,

Paranephrin (adrenalin) 0.0003 gm.

A compound which combines the immediate action of adrenalin with the prolonged effect of Ephetonin. It is specially indicated for hypodermic administration in severe cases of asthma, and in collapse during anæsthesia and operation.

A recent addition!

EPHETONIN PEARLS

Facilitates the administration of Ephetonin in small doses, hence its use in pædiatrics and as a prophylactic.

Supplied as follows:

Ephetonin Powder, in bottles of $\frac{1}{2}$ oz.

*Ephetonin Ampoules, gr. $\frac{1}{2}$ in 1 c.c.
in boxes of 6 ampoules.*

Ephetonin Tablets, of gr. $\frac{1}{2}$, in bottles of 25.

Ephetonin Pearls in bottles of 50.

~~Ephedralin Ampoules~~, in boxes of 6.

Agents in India:—

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BOMBAY

expecting an infant, with all its human metabolic individualities, to thrive when its feeding is forced into a metabolic groove which is peculiar to the calf.

'Lactogen' is a dried milk product prepared by the Nestle and Anglo-Swiss Condensed Milk Co., and is cow's milk scientifically modified by the addition of cream and lactose to provide the correct balance for the human infant. It contains nothing but the normal constituents of human milk, and is entirely free from starchy matter. Desiccation is effected by the roller process. The following figures for composition are given by the manufacturers:—

		Lactogen (diluted with Breast milk 6½ parts of Cow's milk water)		
Fat	..	3.3%	3.26%	3.5%
Carbohydrates		6.0%	5.80%	4.7%
Proteins	..	1.7%	3.15%	3.4%

The fat globules in cow's milk are larger and coarser than in breast milk; in Lactogen the process of preparation renders the fat particles as small as or even smaller than those in breast milk, and therefore easily assimilable. The carbohydrate proportion is almost identical with that in breast milk. A special virtue of dried milk is that the curd is very fine and soft, and much more easily digested than that in fresh cow's milk.

It is claimed by the makers that vitamins A, B, and D are well supplied to the infant in Lactogen, that Lactogen is richer in vitamin C (the anti-scorbutic factor) than is ordinary milk, though the feeds should be supplemented by orange juice or vegetable juice, that the mineral content of Lactogen—0.69 per cent. when diluted with 6½ parts of water, as compared with 0.2 per cent. in breast milk—is very high, thus tending to eliminate rickets and other deficiency diseases. Finally, Lactogen is free from tubercle bacilli, and contains less than 100 organisms per c.cm., when reconstituted by the addition of water.

Lactogen has now been on trial for several years, and has a well-deserved reputation in the feeding of infants. The Indian agents are the Nestle and Anglo-Swiss Condensed Milk Co., Ltd., P. O. Box No. 396, Calcutta, who will be glad to supply particulars and samples on request.

'CATALSAN'

'CATALSAN' is a tuberculin product prepared by the Swiss Serum and Vaccine Institute, Berne, under the control of Professor Sobernheim of the University of Berne and Professor Weichardt of Erlangen. The method of preparation is stated to be as follows:—tubercle bacilli are grown under controlled conditions in a liquid medium, and at a certain stage the culture is filtered so as to be bacteria-free. The filtrate is treated with electrolytes, succeeded by dialysis, precipitation and redissolving of the precipitate; this process is repeated until a definite albumose fraction is separated out, this fraction being 'Catsan'. 'Catsan' is a yellowish-brown powder, readily soluble in water, yielding a neutral slightly opalescent solution. It becomes decomposed at 50°C., and also under the influence of ultraviolet rays.

It is claimed for 'Catsan' that it is completely non-toxic on injection into animals of even 50 times the therapeutic dose. It has no deleterious action on the heart, causes no sensitization on repeated injection, and increases the general resistance to tuberculosis. In general it is claimed that its special effect is to reduce the toxic phenomena in all forms of tuberculosis, including pulmonary tuberculosis.

The drug is put up in paired ampoules. For use the contents of a white ampoule, containing 'Catsan',

are mixed with the contents of a brown ampoule containing an isotonic anæsthetic solution. The mixed solution is injected intramuscularly on alternate days, commencing with a course of some twenty injections of 'concentration 1', followed by a course of injections of 'concentration 2'.

The preparation is put up in packages of 10 and of 100 ampoules, and the agents for the British Empire are Messrs. Coates & Cooper, Ltd., 94, Clerkenwell Road, London, E.C. 1, who will be glad to supply information and literature upon request.

NEOTROPIN, SCHERING

DYE-STUFF therapy has been more and more widely recognized and adopted in recent years. The good effects of the dyes are due to their great powers of penetration and to their great affinity for the tissues, as well as to their bactericidal properties which give them a very wide field of application in therapeutics.

'Neotropin' is a dyestuff derived from an azopyridine base, and is a micro-crystalline powder with a light yellow colour slightly tinged with red; it dissolves in water to form a light yellow solution. The therapeutic doses are far below the toxic level, and the drug is quickly absorbed and eliminated by the kidneys and partly also by the liver in the bile. The urine assumes a yellowish-red colour which is particularly marked on the surface scum.

In experimental work with bacteria grown in urine, 'Neotropin' exerts an extremely marked bactericidal action, even in dilutions of 1 : 520,000. The drug is indicated in all septic conditions of the genito-urinary tract, and is stated to act in both acid and alkaline urines. It has been found of value in bacteriuria, pyelitis, pyelonephritis, and as a disinfectant of the urinary tract prior to surgical interference, as in cases of calculus, prostatectomy, or vesical tumour. In all stages of gonorrhœa it is claimed to be of value, and microscopical tests show the rapid clearing of gonococci in films from the urethra after its use. It is also indicated in diseases of the gall-bladder.

The drug is given orally, and is put up in bottles containing 30 dragées, each of 1.5 grains. The usual dose is 2 dragées t.d.s., and in chronic infections interrupted courses of treatment may be given.

The Indian agents are Schering-Kahlbaum (India), Ltd., P. O. Box No. 2006, Stephen House, 4, Dalhousie Square, East, Calcutta, who will be glad to supply samples and literature on application.

IMITATIONS OF ANTIPHLOGISTINE

We have been asked by the manufacturers of Antiphlogistine, the Denver Chemical Manufacturing Co., to insert the following note with regard to imitations of Antiphlogistine:—

The attention of the medical profession is frequently directed to imitations, which are surreptitiously sold for the genuine product.

Because of its conspicuous success throughout the world, substitutions are now being sold for the original Antiphlogistine.

Antiphlogistine is the product of years of specialization and, in addition to the purity of its ingredients, it is compounded according to a definite formula familiar to the medical profession. Furthermore, the special machinery designed for its manufacture produces a stable, homogeneous product, beyond the means of the imitator.

Substitutes are marketed because they afford greater profits to the vendor, at the expense of the quality of the product and, also, at the expense of the patient, who derives no therapeutic benefit from their use.

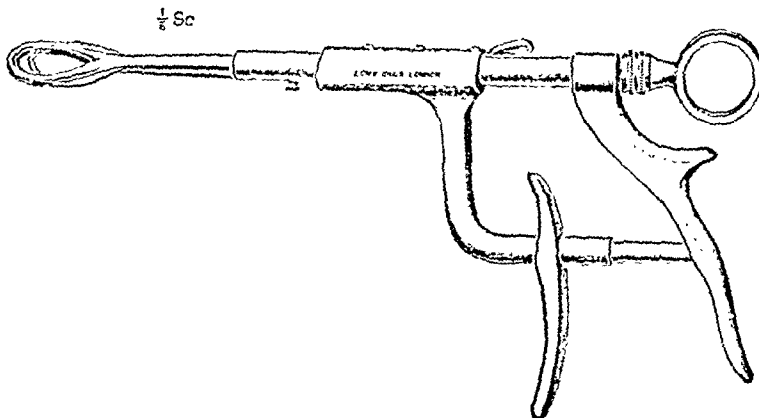
In gratefully acknowledging the confidence which the medical profession has displayed towards Antiphlogistine, the manufacturers respectfully request that, when prescribing, physicians should specify the genuine product.

A NEW TONSIL GUILLOTINE

By Dr. T. B. JOBSON, M.D., M.B., B.Ch., Guilford

The idea of encircling tonsils by means of an inner solid ring moving from behind forwards was originated as long ago as 1832 by W. B. Fahnestock of Philadelphia. C. B. Meding in America has adopted this principle in his guillotine, a straight implement resembling Beck's snare. He claims very good results both from the point of view of complete enucleation and minimum loss of blood. Mr. T. B. Layton has added a handle of the Morel McKenzie type.

I have been using a further modification of Fahnestock's tonsil écraseur. This has a double handle



which affords a squeezing action. The advantages of this instrument are:—

(1) It gives good leverage for enucleating the tonsil by the Whillis method.

(2) As the ring draws the tonsil from behind forwards, it safeguards the anterior pillar from injury.

(3) After the tonsil is firmly gripped in the ring by squeezing the handle, the process is continued by bringing the screw into action. By slowly rotating the ring the base of the tonsil is strangled and separated. If five minutes are allowed for each tonsil, the separation is practically bloodless and causes a minimum amount of trauma.

Its drawbacks are:—

(1) It is not suitable for rapid tonsillectomy with ethyl chloride.

(2) It requires a prominent tonsil. For a flat tonsil, I prefer the Jenkin's guillotine.

I have to thank Messrs. Down Bros. for their skill in carrying out my design of this instrument.

A NURSES' APPOINTMENT BUREAU

LADIES proceeding to England with children may be interested in a new service instituted by Messrs. Cow and Gate, Ltd., the well-known manufacturers of dried milk products. This is a Nurses' Appointment Bureau at No. 1A, Grosvenor Gardens, London, S.W. 1. Here they have on their books the names of a large number of nurses and nursery governesses of the highest standing. Everything possible is done to pick only selected and suitable candidates, and the bureau is anxious to assist ladies looking for nurses or nursery governesses for their children in every possible way.

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Original Articles

A STUDY OF MONKEY-MALARIA, AND ITS EXPERIMENTAL TRANSMISSION TO MAN

(A PRELIMINARY REPORT)

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Introduction

THERE are a few occasions (and only a few, in our opinion) when the publication of 'preliminary' papers or reports is justifiable. Thus a preliminary report may be advisable in order to claim priority for a discovery, or when—a new and probably extensive field for scientific enquiry having opened out—it is advisable to take stock of the position, to outline a future programme, and to lay a foundation, as it were, before proceeding to further work which may take months (or more probably years) of investigation. Both these factors enter into the report which follows; our studies in monkey-malaria have only extended over the past nine months, but we are anxious to clear the ground for future investigation by the publication of this preliminary report. As far as possible we hope to make this report a brief one, and to omit all unnecessary detail, leaving full protocols, etc., for future publications.

In what follows there are four main points to which we desire to draw the reader's attention:—

(i) The very great variation in susceptibility or resistance to a single species of monkey *Plasmodium* by monkeys of different genera and species.

(ii) The spontaneous occurrence of hæmoglobinuric fever as a terminal event in monkeys of species *Macacus rhesus*, dying from this strain of monkey-malaria, and that, in the absence of any quinine administration.

(iii) The successful experimental transmission of monkey-malaria to man, and the clinical features of the disease as studied in man.

(iv) The extremely puzzling variations in the morphology of one and the same species of monkey *Plasmodium* when introduced into simian hosts of different genera and species, and in man.

* * * * *

Experimental work on malaria in the human subject is attended with many difficulties.

Calcutta has the reputation of being a malarious city, but actually the reverse is the case. Its environs are malarious, and the further afield one goes the more intense becomes the endemicity of malaria in Lower Bengal. Although *Anopheles stephensi* breeds in almost every water cistern in Calcutta city, yet spleen rates are zero or only slightly above zero, and gametocyte carriers are so scanty that they are difficult to procure for mosquito feeds. Further, the ordinary Bengali is sufficiently sophisticated to take quinine on his own initiative when he gets fever—though he will not infrequently come to the out-patient department of the School to have the diagnosis of malaria microscopically verified. Even when such a patient can be induced to come into hospital for treatment, if mosquitoes are fed upon him for experimental work, he usually leaves the hospital the next morning! Patients naturally have to be treated, and then become useless for clinical investigations. They leave hospital long before they are radically cured, and it is usually impossible to follow them up.

For all these reasons we have been attempting for several years to establish in our department a strain of avian or of simian malaria for experimental work. Here, again, we have encountered difficulties. *Hæmoproteus* infections are very common in many different types of birds in Calcutta, but *Plasmodium* infections are so rare that we have not yet encountered one; conditions must have changed very greatly in Calcutta since the days of Sir Ronald Ross' great discovery. Also, under the old-fashioned name 'Proteosoma' it now appears that there are at least three—if not five—different species of *Plasmodium* included. It is almost impossible to keep sparrows alive in captivity, whilst canaries are very expensive. Monkeys offer a more hopeful field for study, and from time to time we have examined many batches of monkeys—chiefly *Macacus rhesus*—kept at the School, but previously with negative results.

In July 1931, Dr. H. G. M. Campbell of the Kala-azar Research Department of the School found an extremely scanty infection with a *Plasmodium* in a *Cercopithecus pygerythrus* monkey said to have been imported from Singapore. The junior author (B. M. D. G.) took a Bass culture from this animal, and it yielded a good growth of a *Plasmodium* rather similar in its morphology to *Plasmodium vivax* of man. From this animal the strain was passed into a second *Cercopithecus* monkey of the same species, and was thus established in the department. We are most grateful to Dr. Napier and to Dr. Campbell for permitting us to use this strain. After nine months' work with this virus it is now being regularly maintained in our department, and graph I shows the various monkey and human passages to date.

Passages of the virus (graph I)

We hope in the future to study this *Plasmodium* systematically in different species of monkeys, but hitherto we have had to utilize such monkeys as were available in the Calcutta markets. (We are very greatly indebted to Dr. Bains Prasad, Officiating Director, Zoological Survey of India, of the Indian Museum for identifying for us the species of several of the animals used.)

The symbols used in graph I are indicated in the letterpress in the graph. A ring round an animal indicates that quinine was administered intramuscularly, and that the animal recovered. A square indicates that the infection proved fatal. A ring plus a square indicates that quinine was administered, but that in spite of this the animal died. Hæmoglobinuria is indicated by a deep black lower shading in the square. The vertical lines in graph I are proportional to the incubation periods to the first appearance of parasites in the inoculated animals. In all up to date we have studied the infection in the following hosts (43 animals belonging to 7 different species):—

<i>Cercopithecus pygerythrus</i> monkeys (C)	..	9
<i>Macacus rhesus</i> monkeys (R)	..	23
<i>Macacus radiatus</i> monkeys (M)	..	4
<i>Macacus cynomolgus</i> monkeys (Cy)	..	1
<i>Semnopithecus entellus</i> monkeys (S)	..	2
<i>Hylobates hoolock</i> ape (H)	..	1
Man (human volunteers, V)	..	3

In addition to these, five other inoculated monkeys have been omitted from graph I; these died of intercurrent disease—pulmonary tuberculosis or lobar pneumonia. Other monkeys which were inoculated to test the infectivity of the blood of infected human volunteers, or to confirm spontaneous recovery from the infection will be mentioned later; these were all of species *Macacus rhesus*, since this monkey is exceedingly susceptible.

In all cases (except in the case of human volunteer No. 3, who was not under our direct control) thin and thick blood films were examined before the host was inoculated, and a Bass culture taken to make certain that the host was not harbouring latent malaria of its own. Almost all infections were studied by the enumerative method of Sinton (1924)*,

* We cannot speak too highly of this method, which we have now used systematically for four years in the study of malaria. Certain points with regard to it are important, however. In preparing the suspension of fowl's erythrocytes, the counts must be repeated; and an average of not less than 12—or preferably 20—counts taken before the suspension is diluted down to the necessary degree. The emulsion is kept in a rubber-capped bottle in an ice chest; our present emulsion was made in 1928 and has kept perfectly ever since. An amount just sufficient to last for a week or ten days is taken at a time from this for daily use into an insulin bottle. In taking up the material into the capillary pipette, first the volume of corpuscle suspension and then the volume of blood should be taken in that order;

and the dose of parasites given to each host was known. Human volunteers Nos. 1 and 2 were inoculated subcutaneously, volunteer No. 3 intradermally; all monkeys were inoculated intramuscularly.

Part I. Clinical aspects of the disease

We may here deal in turn with the different species of hosts concerned.

1. *Cercopithecus pygerythrus*.—Here ten animals were inoculated. One, inoculated with 0.5 c.cm. of blood from *Cercopithecus* C 1 at a time when the latter showed only very scanty rings, failed to take and is not shown in graph I.

The incubation periods varied from 7 to 11 days, varying with the dose of parasites inoculated. Parasites are present in scanty numbers, off and on for long periods of time, but the animal shows no evidence of disease, and there is no enlargement of the spleen. No. 2 showed scanty parasites for 56 days, then no parasite for 71 days, then again a scanty infection, then again no parasites; it is to-day alive and well and still shows infection at times. The highest count recorded was 1,480 per c.mm., and the highest temperature shown by any animal 104.2°F. Gametocytes are fairly numerous throughout the infection, and in general morphology the parasite closely approximates to *Plasmodium vivax* of man (plate I, figures 1 to 12, and plate VI, fig. 1). The infection is readily cleared by quinine—doses of approximately gr. 1 intramuscularly daily, but if insufficient quinine is given relapses occur. Of the nine monkeys infected, seven recovered spontaneously from the infection after more or less prolonged periods of a low grade of infection, whilst one is still infected. The ninth monkey received quinine (probably unnecessarily).

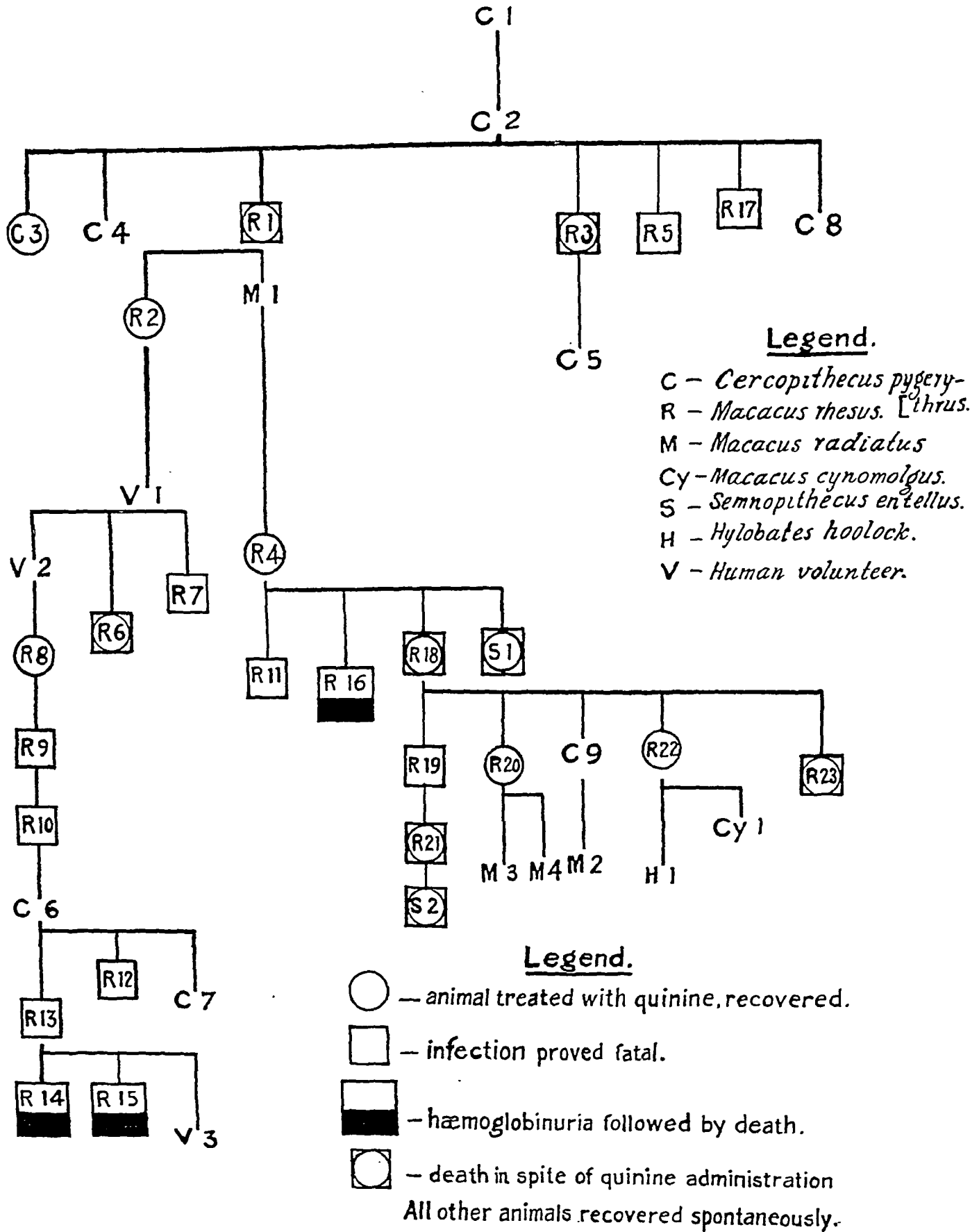
The temperature chart and counts in a typical infection are shown in chart I.

2. *Macacus rhesus* (chart II).—Here the clinical picture is completely different. This animal is extremely—almost, one might say, exquisitely—susceptible to infection. This is well illustrated in R 4 in graph I. It was inoculated with only 0.2 c.cm. of blood from *Macacus radiatus* M 1; the blood of the latter showed only 80 parasites per c.mm.—very scanty rings, gametocytes, and schizonts—and the total dose injected amounted to only 16,000 parasites. The incubation period was very prolonged—31 days—but the infection then flared up, with counts up to 224,400 per c.mm., whereupon the animal was treated with quinine.

So extremely susceptible is *M. rhesus* to infection that, as will be explained later, we are

otherwise blood may be left in the pipette, and the count may not be completely accurate. The slides used must be perfectly free from grease, in order that the films shall be perfectly uniform; for this purpose they should be rubbed with prepared chalk before use.

GRAPH I
Showing passages of virus



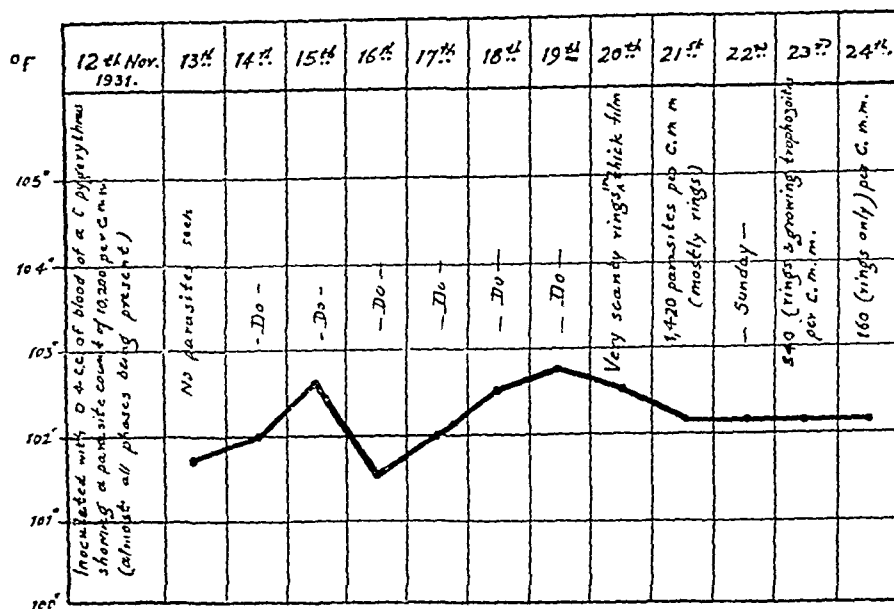
now resorting to inoculation of this monkey as being the most delicate test available as to whether the blood of a given host is or is not infective. It is an even more delicate test than culture.

The incubation period varied with the dose given, but in general is from 4 to 11 days, usually 7 or 8 days to the first appearance of parasites in the films. There then sets in very

brown, colour. (We do not propose here to deal with the histopathology of these infections, since this subject demands separate and detailed study.) Before death blood films show intense anæmia with marked anisocytosis, numerous normoblasts and Howell-Jolly bodies, frequent basophilia, and often a marked increase in platelets. The large hyaline mononuclear leucocytes may be loaded with hæmoglobin pigment.

CHART I

Monkey (*C. pygerythrus*) C 2 of graph I
Weight before inoculation 1 kg. 922 grams



The animal is alive and perfectly well.
16th March, 1932.

high fever, usually of daily remittent character, with temperatures rising to 105°F., 106°F., and even—in one monkey—as high as 106.2°F.* The parasite counts—at first low—rapidly soar, and may reach a figure of one to three million parasites per c.m.m. before death. In most infections gametocytes are produced abundantly. In the meantime the monkey becomes severely ill, with complete prostration, and intense anæmia, the mucous membrane of the lips and mouth resembling white blotting paper.

This condition lasts from 3 to 7 days—average period 5 days. The temperature now falls suddenly to subnormal and the animal dies. At autopsy the spleen is enlarged, black in colour, and soft and diffuent. Smears and sections from the viscera show an almost incredible state of affairs; every organ shows masses of sporulating parasites and is loaded with pigment of a blackish, though also slightly

Chart II shows the temperature record and parasite counts in a typical fatal infection in *Macacus rhesus*. Photomicrograph 2 shows typical early infection in *M. rhesus*, and in the centre of the field a mature schizont-rosette with 8 merozoites and a dense excentric cluster of pigment. Photomicrograph 3 is from a blood film taken from a dying *M. rhesus* six hours before death; the extreme intensity of the infection will be noted—nearly 90 per cent. of the erythrocytes being infected; this animal was suffering from hæmoglobinuria at the time when the film was taken.

The infection is invariably fatal in *Macacus rhesus* monkeys, whether young or old. If quinine be administered intramuscularly in full doses—gr. 1 daily for four or five days of quinine bihydrochloride to a monkey weighing 2 to 3 kilogrammes—the animal can be saved. If insufficient quinine is given at longer intervals the disease runs a more chronic course, the parasite count may remain low, but severely progressive anæmia develops, and the animal dies; such animals in this state are very susceptible to intercurrent infections, especially

* Byam and Archibald state that the normal temperature of *Macacus rhesus* is 101°F. On the other hand we have frequently found temperatures of 102°F. in normal *M. rhesus*.

pneumonia. Photomicrograph 4 is from a blood film taken from an animal insufficiently treated with quinine; it will be seen that there is extreme anisocytosis, normoblasts are present, many of the corpuscles show basophile staining, whilst near the centre of the field is a large hyaline mononuclear leucocyte loaded with hæmoglobin pigment.

Of the 23 *M. rhesus* monkeys shown in graph I, 5 recovered after quinine administration, 6 died in spite of quinine administration, and 12 untreated monkeys all died rapidly. It should be noted further that the same sequence of events and fatal termination occurs whether the *M. rhesus* be inoculated with infected blood from *Cercopithecus*, from *Macacus*

one *Cercopithecus*, two *M. rhesus*, two human volunteers, three *M. rhesus*, and one *Cercopithecus* in turn. Yet the infection, both clinically and morphologically, held true to 'rhesus' type.

2nd November, 1931.—Given 0.5 c.cm. of blood from *Cercopithecus* C 6, with a parasite count of 12,800 per c.mm., showing growing trophozoites, schizonts and early gametocytes.

7th November, 1931.—Temperature 103.4°F.; scanty rings present in films.

9th November, 1931.—Temperature 103.8°F.; rings in fair number in films.

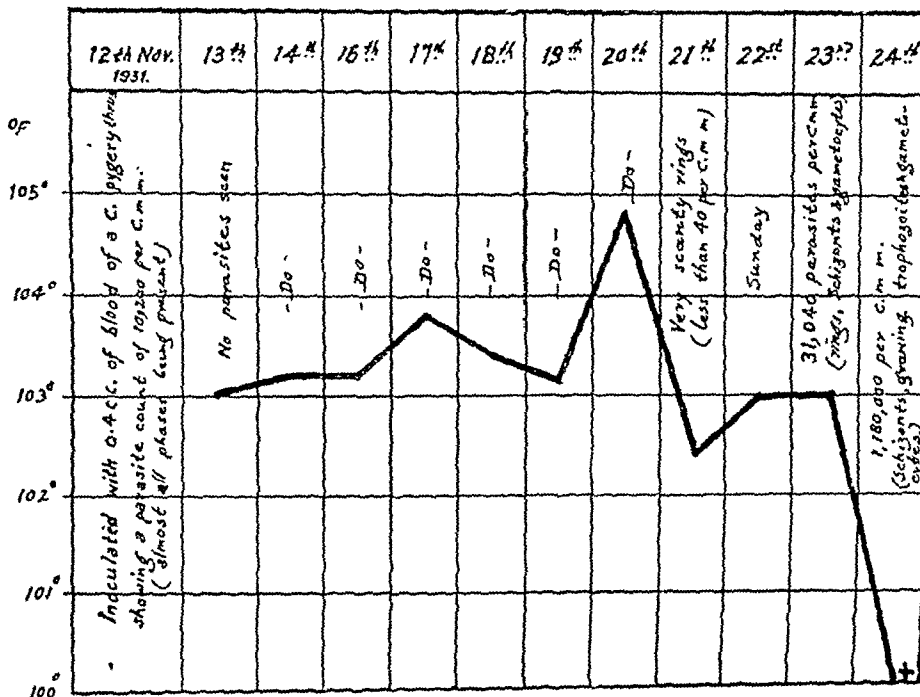
10th November, 1931.—Temperature 105.2°F.; count 200,000 parasites per c.mm., chiefly rings showing early division of chromatin.

11th November, 1931.—Temperature 105.6°F.; count 680,000 parasites per c.mm., chiefly rings, but also a fair number of schizonts and gametocytes.

Animal died that night.

CHART II

Monkey (*M. rhesus*). Weight before inoculation 4 kg. 480 grams



The animal died at night.

radiatus, from infected human volunteers, or in serial passage from other infected *Macacus rhesus* monkeys.

A few examples may next be given of the infection in *Macacus rhesus* :—

M. rhesus R 5 of graph I.

12th September, 1931.—Given 0.5 c.cm. of infected blood from *Cercopithecus* C 2, showing very scanty rings and schizonts, count 240 parasites per c.mm.

21st September, 1931.—Temperature 101.2°F. No parasites seen.

22nd September, 1931.—Temperature 102°F. Very scanty schizonts.

23rd September, 1931.—Temperature 100.4°F. Count 2,880 per c.mm., schizonts and gametocytes.

24th September, 1931.—Temperature 104.8°F. Count 34,800 per c.mm., very numerous schizonts and a few gametocytes.

25th September, 1931.—Temperature 99°F. Count 1,500,000 per c.mm., chiefly rings.

Animal died that night.

M. rhesus R 12 of graph I.—This animal was inoculated with a strain which had been passed through

M. rhesus R 17 of graph I.—Inoculated from the original *Cercopithecus* strain.

8th December, 1931.—Given 0.2 c.cm. of blood from *Cercopithecus* C 2, showing a parasite count of 1,480 per c.mm., schizonts, gametocytes, and scanty growing trophozoites.

14th December, 1931.—Very scanty rings in films.

15th December, 1931.—Temperature 103.2°F. Count 14,800 per c.mm., chiefly rings.

16th December, 1931.—Temperature 103.8°F. Count 33,800 per c.mm., rings, growing trophozoites, and a few gametocytes.

17th December, 1931.—Temperature 105.4°F. Count 284,000 per c.mm., rings and scanty gametocytes.

18th December, 1931.—10-30 a.m. Temperature 103.4°F. Count 233,000 per c.mm., growing trophozoites, early schizonts, and gametocytes.

5 p.m. Monkey moribund. Blood films show an extremely intense infection, some 80 per cent. of the erythrocytes being infected, mostly ring forms present.

Animal died that night.

M. rhesus R 2 of graph I.—Monkey cured with quinine.

15th August, 1931.—Given 0.5 c.cm. of blood from *M. rhesus* R 1 of graph I, showing a large number of

parasites, chiefly growing trophozoites with a fair number of gametocytes.

22nd August, 1931.—Scanty rings in films.

24th August, 1931.—Temperature 104.8°F. Numerous rings and schizonts in films.

25th August, 1931.—Temperature 105.8°F. Films full of schizonts, with also rings and gametocytes.

Quinine bihydrochloride grain 1 intramuscularly.

26th August, 1931.—Temperature 102.4°F. Films full of schizonts, with also rings and numerous gametocytes.

Quinine bihydrochloride grain 1 intramuscularly b.d.

27th August, 1931.—Temperature 102.6°F. Films show scanty rings and growing trophozoites.

28th August, 1931.—Temperature 103.2°F. No parasites seen in films.

29th August, 1931.—Temperature 103°F. Very scanty rings in films.

Quinine bihydrochloride grains 1½ intramuscularly.

30th August, 1931.—Temperature 102.4°F. No parasites seen.

31st August, 1931.—Temperature 103°F. No parasites seen in films, but marked anaemia, anisocytosis, normoblasts, megaloblasts, and Howell-Jolly bodies present. Platelets increased.

2nd September, 1931.—Temperature 103°F. No parasites seen.

15th September, 1931.—Scanty rings in films; relapse.

17th September, 1931.—Very numerous rings and some schizonts in films.

19th to 25th September, 1931.—Temperature 102°F. to 103.4°F. No parasites seen.

26th September to 2nd October, 1931.—Temperature 102.6°F. to 103.4°F. Scanty parasites in films.

3rd October, 1931.—Temperature 102.8°F. Rings, schizonts and gametocytes in films.

5th October, 1931.—Temperature 106°F. Films full of rings with some gametocytes.

6th October, 1931.—Temperature 104.8°F. Rings, numerous schizonts, and some gametocytes in films.

Given grain 1 quinine bihydrochloride intramuscularly.

7th October, 1931.—Temperature 104°F. Fairly numerous growing trophozoites in films.

Given grain 1 quinine bihydrochloride intramuscularly.

9th October, 1931.—Temperature 105°F. No parasites seen.

29th October to 8th December, 1931.—Monkey in good health. No parasites seen.

17th March, 1932.—Monkey in excellent health.

Blood negative.
It will be seen in this animal that sufficient quinine was not given at first to prevent a relapse, but the relapse proved readily amenable to further quinine therapy.

M. rhesus R 18 of graph I.—Chronic, fatal infection after insufficient quinine.

14th December, 1931.—Given 0.75 c.cm. of blood from *Macacus rhesus R 4*, with a parasite count of 28,240 per c.mm., chiefly rings.

22nd December, 1931.—Films full of rings, with schizonts and gametocytes also present.

Given quinine bihydrochloride grain 1 intramuscularly.

23rd December, 1931.—Films full of rings with schizonts and gametocytes also present.

Given quinine bihydrochloride grain 1 intramuscularly.

24th December, 1931.—No parasites seen in films.

29th December, 1931.—Temperature 104°F. Scanty rings in films; anisocytosis, normoblasts, hæmozoin in large mononuclears.

30th December, 1931.—Temperature 105°F. Films show rings, gametocytes, and many mononuclears with ingested hæmozoin.

31st December, 1931.—Films show growing trophozoites and some gametocytes. Pigment-bearing mononuclears abundant.

1st January, 1932.—Films show growing trophozoites and some gametocytes. Pigment-bearing mononuclears abundant. Rings and normoblasts also in films.

2nd January, 1932.—Films show growing trophozoites and some gametocytes. Pigment-bearing mononuclears abundant. Rings and normoblasts also in films.

4th January, 1932.—Temperature 102.6°F. Films full of rings showing early division of chromatin; also growing trophozoites. Very numerous normoblasts, and pigment-bearing mononuclears.

11th January, 1932.—Temperature 102.4°F. Rings, growing trophozoites, and pigment-bearing mononuclears in films.

26th January, 1932.—No parasites seen in films, but pigment-bearing mononuclears present.

6th February, 1932.—Temperature 102.8°F. Rings and growing trophozoites in films.

16th February, 1932.—No parasites in films.

22nd February, 1932.—The animal is extremely anæmic (anæmia of macrocytic type). Parasite count 4,480 per c.mm., rings and trophozoites. The films also show abundant normoblasts, anisocytosis, and pigment-bearing mononuclears.

Animal died that afternoon.

It will be seen that in this animal the infection persisted at a low level for two months, and finally killed the monkey from severe anaemia.

Blackwater fever in Macacus rhesus.—Three of the infected *Macacus rhesus* monkeys showed acute hæmoglobinuria as a terminal event, shortly before death—R 14, R 15 and R 16 in graph I. A study of graph I shows that these monkeys—especially R 14 and R 15—were inoculated with virus which had been serially passaged through other *M. rhesus* monkeys; that the incubation periods were shortening, and that the virus was apparently becoming exalted in virulence. So far we have seen hæmoglobinuria only in *Macacus rhesus*, and then only as a terminal event just preceding death, associated with extremely intense—almost terrific—infections. During life the urine passed is deep red in colour, but darkens to a porter colour on standing, whilst at autopsy the bladder is found to contain urine which is almost black in colour.

These monkeys are so important that details with regard to them must be given. None of them received any quinine.

M. rhesus R 14 of graph I.

23rd November, 1931.—Given 0.2 c.cm. of blood from *M. rhesus R 13*, showing a parasite count of 31,040 per c.mm., rings, schizonts, and gametocytes.

28th November, 1931.—Scanty rings in films.

30th November, 1931.—Temperature 104°F. Films full of rings.

1st December, 1931.—Temperature 104°F. Films full of rings and schizonts.

2nd December, 1931.—Temperature 102°F. Acute anaemia; red corpuscle count 3,720,000 per c.mm. Parasite count (estimated as against red cell count) approximately 3,348,000 per c.mm., all rings. Photomicrograph 3 is from one of these films.

Commenced to pass hæmoglobinuric urine at 5 p.m. Animal died that night.

M. rhesus R 15 of graph I.

23rd November, 1931.—Given 0.2 c.cm. of blood from *M. rhesus R 13*, showing a parasite count of 31,040 per c.mm., rings, schizonts and gametocytes.

27th November, 1931.—Scanty rings in films.

30th November, 1931.—Temperature 106°F. Parasite count 280,000 per c.mm., chiefly rings.

1st December, 1931.—Temperature 106.2°F. Some 85 per cent. of the erythrocytes infected; estimated parasite count 3,100,000 per c.mm., all rings.

Passed hæmoglobinuric urine throughout the day. Animal died that night.

M. rhesus R 16 of graph I.

4th December, 1931.—Given 0.25 c.cm. of blood from *M. rhesus* R 4, showing a parasite count of 280 per c.mm., all rings.

15th December, 1931.—Scanty rings and schizonts in films.

16th December, 1931.—Temperature 102.8°F. Parasite count 25,400 per c.mm., rings, growing trophozoites and young gametocytes.

17th December, 1931.—Temperature 103.2°F. Parasite count 52,000 per c.mm., growing trophozoites, schizonts and gametocytes.

18th December, 1931.—Temperature 102°F. Parasite count 67,200 per c.mm., growing trophozoites and early gametocytes.

21st December, 1931.—Animal moribund, and passing hæmoglobinuric urine. Parasite count as estimated against red corpuscle count approximately 2,976,000 per c.mm., all rings.

Animal died that afternoon. Full autopsy. Tissues preserved.

We will postpone discussion of these results until later in this paper.

3. *Macacus radiatus* (chart III).—Here four monkeys were used, M 1, M 2, M 3 and M 4 of graph I. Three were inoculated with blood from infected *Macacus rhesus*, and one

recovery ensued. In M 3 a scanty infection persisted for 5 days, rings, growing trophozoites, schizonts and gametocytes were all seen in the films, and the highest temperature reached was 104.2°F.; the monkey then spontaneously recovered. In M 4 a mild infection persisted for 5 days, and thereafter spontaneous recovery took place.

There is no appreciable enlargement of the spleen in this species, and the monkey does not seem to be ill in any way. It is of great interest to contrast the extreme mildness of the infection in *M. radiatus* with the hyperacute infections in *M. rhesus*, although both monkeys belong to the same genus.

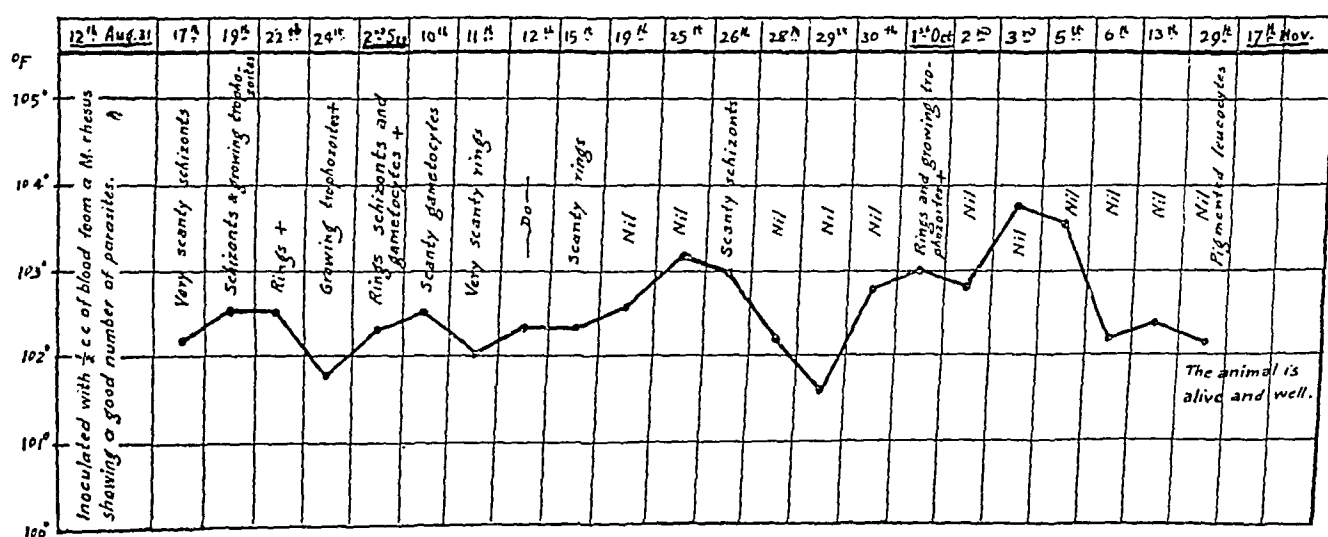
4. *Macacus cynomolgus*.—Only one monkey of this species has been available up to date—Cy 1 of graph I. Its history was as follows:—

20th February, 1932.—Given 0.5 c.cm. of blood from *Macacus rhesus* R 22, showing 192,000 parasites per c.mm., rings only.

26th February, 1932.—Rings and growing trophozoites in films.

CHART III

M. radiatus (a young specimen). Weight 1 kg. 925 grams



with infected blood from *Cercopithecus pygerythrus*. In all the infections were of mild type, and in all spontaneous recovery occurred.

The incubation periods ranged from 5 to 9 days, varying with the dose of parasites injected. In M 1 there was a mild, relapsing infection lasting for 41 days; thereafter the infection cleared, and the monkey is to-day in good health (19th March, 1932). Its temperature chart is shown in chart III. The infection was throughout scanty, but gametocytes were present throughout, and hæmozoin-containing large mononuclear leucocytes were seen. In M 2, inoculated with only a small dose of parasites from a *Cercopithecus*—0.3 c.cm. of blood containing 800 parasites per c.mm., growing trophozoites, schizonts and gametocytes—the incubation period was 9 days, the scanty infection persisted for 18 days, and then spontaneous

recovery ensued. In M 3 a scanty infection persisted for 5 days, rings, growing trophozoites, schizonts and gametocytes were all seen in the films.

1st March, 1932.—Scanty trophozoites and schizonts.

2nd March, 1932.—Scanty trophozoites and schizonts.

3rd to 19th March, 1932.—Blood negative; animal in good health.

This animal at no time showed any appreciable symptoms, and the infection cleared up spontaneously. *Macacus cynomolgus* would thus appear to react in the same manner as *M. radiatus*.

5. *Semnopithecus entellus*—the 'hunuman' monkey of Assam. Here two animals were used, S 1 and S 2 of graph I. Both were inoculated with heavy doses of virus from *Macacus rhesus* monkeys, both contracted a severe infection with grave anæmia; an attempt was made in both cases to save the animal by quinine administration, but both monkeys died of lobar pneumonia. Details are as follows:—

Semnopithecus entellus S 1 of graph I.

16th December, 1931.—Inoculated with 0.2 c.cm. of blood from *Macacus rhesus* R 4, showing a count of 224,000 parasites per c.mm., chiefly rings.

22nd December, 1931.—Very scanty rings in films.

23rd December, 1931.—Temperature 103.6°F. Schizonts in films.

24th December, 1931.—Temperature 103.2°F. Parasite count 434,000 per c.mm., schizonts and gametocytes.

A *Macacus rhesus* (not shown in graph I) was inoculated on this date with 0.1 c.cm. of blood from S 1. This *M. rhesus* has since remained in good health and has never shown any infection.

25th December, 1931.—Temperature 105°F. Parasite count 723,000 per c.mm., very numerous growing trophozoites, early schizonts, and some gametocytes.

26th December, 1931.—Temperature 104.2°F. Parasite count 112,800 per c.mm., numerous growing trophozoites and early schizonts, with some gametocytes.

A second *Macacus rhesus* (not shown in graph I) was inoculated on this date with 0.4 c.cm. of blood from S 1. This *M. rhesus* has since remained in good health and has not shown any parasites.

27th December, 1931.—Films show exceedingly numerous growing trophozoites, with some rings and gametocytes.

28th December, 1931.—The animal is extremely ill and very anæmic. Parasite count 13,600 per c.mm., growing trophozoites, schizonts and gametocytes.

Quinine bihydrochloride grains 1½ injected intramuscularly.

29th December, 1931.—Very scanty parasites in films.

Quinine bihydrochloride grain 1 injected intramuscularly.

30th December, 1931.—Temperature 101°F. Films show scanty schizonts, hæmoglobin-bearing large mononuclears, very marked anisocytosis, basophilia, and the presence of normoblasts.

31st December, 1931.—Temperature 101°F. The animal is extremely anæmic. No parasites seen in films.

5th January, 1932.—Temperature 100.8°F. Rings present in films.

7th January, 1932.—Temperature 100.4°F. Scanty trophozoites in films.

12th January, 1932.—The animal died last night. Autopsy showed both lungs completely consolidated.

Semnopithecus entellus S 2 of graph I.

27th January, 1932.—Inoculated with 0.4 c.cm. of blood from *Macacus rhesus* R 21, showing a count of 40,800, chiefly growing trophozoites.

1st February, 1932.—Schizonts, growing trophozoites, and scanty rings in films.

2nd February, 1932.—Temperature 103.8°F. Trophozoites and early schizonts in films.

3rd February, 1932.—Temperature 104°F. Films are full of schizonts, with some trophozoites and gametocytes.

4th February, 1932.—Numerous schizonts, trophozoites and gametocytes in films.

Quinine bihydrochloride grains 1½ intramuscularly.

6th February, 1932.—Animal is extremely anæmic. No parasites seen in films, but very marked anisocytosis, basophilia and many normoblasts present.

9th February, 1932.—Monkey died this afternoon. Autopsy showed both lungs consolidated; spleen blackish, soft and diffuent. Tissues preserved.

The results in both these monkeys are thus somewhat inconclusive, but had no treatment been administered it seems practically certain that they would have died of acute malaria. This species is almost as susceptible as is *Macacus rhesus*, and the infection is very acute and associated with extreme anæmia. The loss of virulence of the strain to *Macacus rhesus* in *Semnopithecus* S 1 requires explanation, and a further study of this point will be necessary.

6. *Hylobates hoolock*—the 'hoolock' monkey of Assam. Only one animal was available—H 1 of graph I. Details are as follows:—

Hylobates hoolock H 1 of graph I.

20th February, 1932.—Inoculated with 0.5 c.cm. of blood from *Macacus rhesus* R 22 of graph I, showing a parasite count of 192,000 per c.mm., all rings.

21st February to 1st March, 1932.—No parasites seen.

2nd March, 1932.—Very scanty rings in films. They resemble those of *Plasmodium malariae* of man, and closely resemble the forms of the monkey parasite in man to be described hereafter.

3rd March to 19th March, 1932.—No parasites seen.

As will be seen, this anthropoid ape is almost in susceptible to infection. The animal did not show any symptoms of illness at any time.

Part II. Experimental transmission of the infection to man.

Up to date we have successfully transmitted infection with this monkey *Plasmodium* to three human volunteers; all three showed parasites (completely different in morphology from that of any of the three human species of *Plasmodium*); in one patient the disease was extremely severe, in another of moderate intensity with a relapse, in the third only a mild grade of intermittent fever resulted.

Details are as follows:—

Human volunteer V 1 of graph I (chart IV).

Manmatha Das, Hindu male, aged 33 years, a resident of Beliaghata, Calcutta city, was admitted to the Carmichael Hospital for Tropical Diseases, Calcutta, on 18th July, 1931, for the treatment of parietic symptoms following an attack of dysentery one year and eight months previously. The patient had lived all his life in Calcutta city. He gave a history of an attack of cholera 15 years previously, and of syphilis 12 years previously.

On examination he was found thin and emaciated. The eyes had a fixed and staring expression. The right knee jerk was increased and the left hand grip much diminished. Eye reflexes were normal, the elbow and wrist jerks were increased, there was a slight Babinsky reflex present, with tremor of the fingers and toes and somewhat hurried speech. Intelligence was normal.

The Widal, Wassermann, aldehyde, and dysentery agglutination serum tests were all negative. Microfilariae were present in the night blood, and hookworm ova in the stools. Bacteriologically, the stools were normal, and showed no protozoa. Thin and thick blood films showed no malaria parasites. Neither the spleen nor the liver was enlarged. The patient denied all history of fever with rigors.

From 18th July, 1931, to 21st August, 1931, various lines of treatment were tried without appreciable improvement. The temperature throughout this period was normal or subnormal.

Diagnosis presented some difficulty, and opinion varied; different opinions given being alcoholic neuritis, residual effects of encephalitis lethargica—though the patient gave no history of fever, and paresis of syphilitic origin.

As the patient was not improving, it was decided to try the effect of induced malaria, and, as the monkey strain of *Plasmodium* was by then well established in the Department, to try to transmit this infection.

22nd August, 1931.—Thin and thick blood films showed no parasites.

23rd August, 1931.—Bass culture—5 c.cm. of blood—taken for malaria. This remained sterile and free from parasites.

On the same afternoon the patient was given 2 c.cm. of blood subcutaneously from *Macacus rhesus* R 2 of graph I, showing a parasite count of 36,400 per c.mm.,

rings and schizonts predominating. This corresponds to a total dose of approximately 72,800,000 parasites injected.

11th September, 1931.—Temperature rose to 99.5°F. No parasites seen*.

12th September, 1931.—Temperature 100.3°F. Rings present in films.

13th September, 1931.—Temperature 101.8°F.

14th September, 1931.—Temperature 101.5°F. Parasite count 4,320 per c.mm., mostly growing trophozoites.

Two c.cm. of blood from the patient was inoculated on this date into a *Macacus rhesus* intramuscularly, R 7 of graph I. This monkey developed very severe malaria 14 days later, and died on the 8th day after first appearance of parasites. The parasite forms present in this *M. rhesus* were of 'rhesus' type, *vide infra*.

15th September, 1931.—Temperature 100.4°F. Parasite count 4,000 per c.mm., growing trophozoites only.

18th September, 1931.—Temperature 99.6°F. Parasite count 120 per c.mm., rings and growing trophozoites.

19th September, 1931.—Temperature normal. Parasite count 80 per c.mm., rings only.

20th to 27th September, 1931.—Temperature normal. No parasites seen.

28th September to 2nd October, 1931.—A mildly febrile relapse with scanty rings and trophozoites in the films.

3rd October to 6th November, 1931.—Temperature normal.

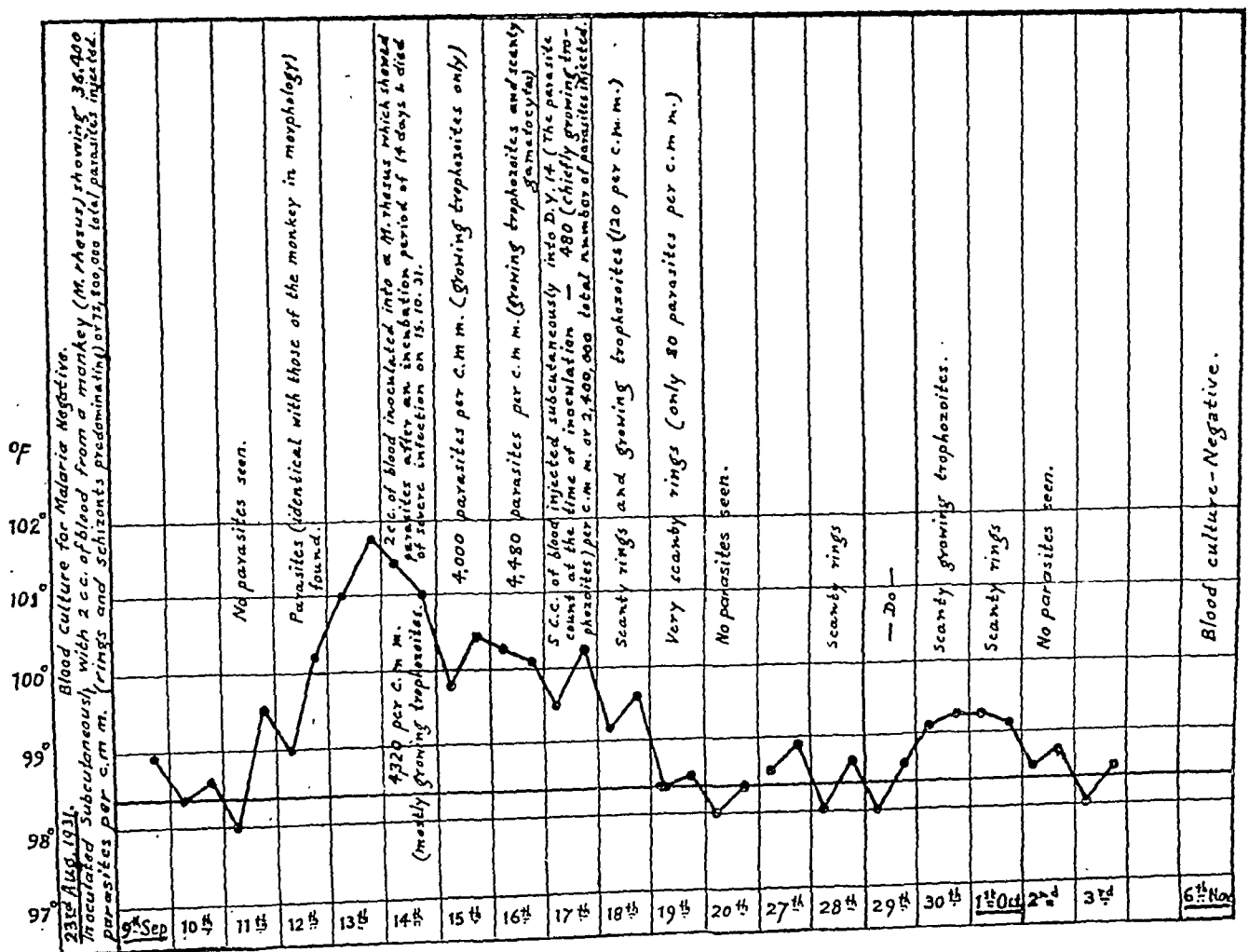
6th November, 1931.—Bass culture taken for malaria; result negative.

7th November to 11th December, 1931.—Temperature normal throughout.

11th December, 1931.—Patient discharged from hospital. There is some improvement in his condition,

CHART IV

Name M. D., age 33. Human volunteer V 1



16th September, 1931.—Temperature 100.3°F. Parasite count 4,480 per c.mm., growing trophozoites and scanty gametocytes.

17th September, 1931.—Temperature 100.2°F. Parasite count 480 per c.mm., chiefly growing trophozoites.

Five c.cm. of the patient's blood was inoculated subcutaneously on this date into human volunteer V 2 of graph I.

probably due rather to prolonged rest and the treatment of secondary infections than to the induced malaria. It is to be noted that the primary attack of fever was of a daily remittent type. The temperature chart and parasite findings are shown in chart IV.

Human volunteer V 2 of graph I.—This volunteer was a sub-passage from volunteer V 1 (chart V).

L. K. Biswas, Hindu male, aged 20, carpenter. 15th September, 1931.—Patient referred to the Department from the Calcutta Medical College with a history of having been bitten on the dorsum of the left foot by a rat six days previously.

On examination, a small ulcer present at the site of the bite. Temperature normal. Examination of serous

* This appears to be an invariable rule in malaria when induced therapeutically; we have seen it to occur again and again in such cases. Fever sets in and may last for one, three, or five days before parasites are detected in the blood films.

exudate from the site of the bite failed to show *Spirillum minus*. A young guinea-pig was inoculated with the patient's blood; but failed to show spirilla at any time. Thin and thick blood films negative for malaria parasites.

Patient comes from Krishnagar, and has been resident in Calcutta only during the last six months.

16th September, 1931.—Again seen in the Protozoology Department. Temperature normal. Examination of serous exudate from the lesion showed no spirilla. Thin and thick blood films showed no parasites present.

to a total dose of approximately 2,400,000 parasites inoculated.

22nd to 25th September, 1931.—Temperature 99°F. to 101°F. No parasites seen.

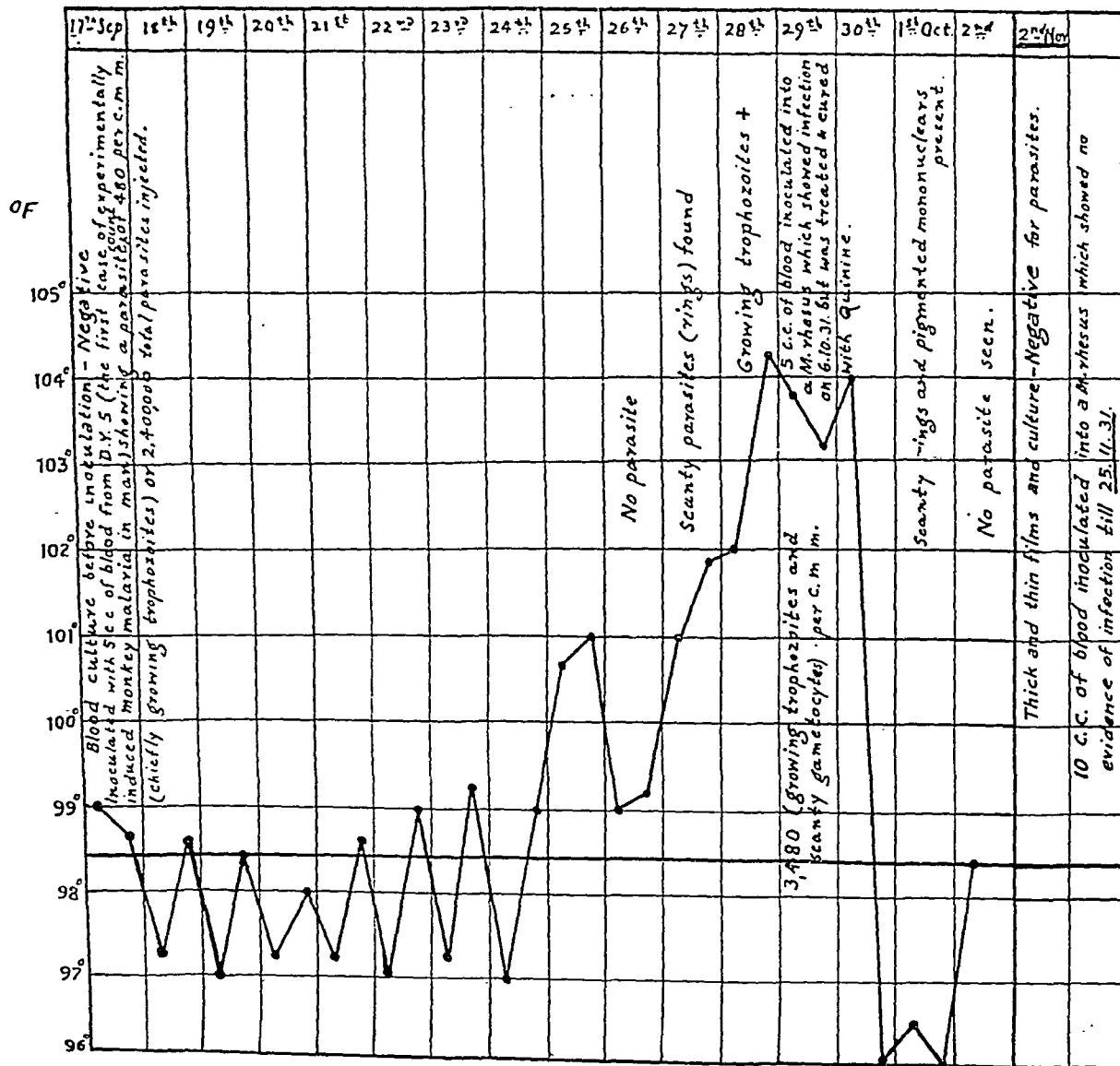
26th September, 1931.—Temperature 99.3°F. No parasites seen*.

27th September, 1931.—Temperature 101.8°F. Scanty rings present in films.

28th September, 1931.—Temperature 101.2°F. Growing trophozoites present in films.

CHART V

Name *Lalit K. Biswas*, age 20. Human volunteer V 2



17th September, 1931.—Bass culture—5 c.c.m. of blood—taken for malaria. Remained sterile and free from parasites.

Patient admitted to the Carmichael Hospital for Tropical Diseases. On admission no enlargement of the spleen or liver could be detected.

Given 5 c.c.m. of blood subcutaneously from human volunteer V 1, showing a parasite count of 480 per c.c.m., chiefly growing trophozoites. This corresponds

29th September, 1931.—Temperature 103.6°F. Parasite count 3,480, growing trophozoites and young gametocytes.

Five c.c.m. of the patient's blood was inoculated on this date into a *Macacus rhesus* R. 8 of graph I. This monkey became infected after an incubation period of 7 days, was treated with quinine and cured.

* Vide footnote to human volunteer V 1.

September, 1931.—Temperature 104°F. The patient was now very seriously ill and comatose. Attempts were made to give him pituitrin and to administer quinine intravenously, but the temperature dropped abruptly to 96°F., and stimulants and quinine had to be administered. No quinine was given.

October, 1931. Temperature 96.4°F. Scanty and hæmoglobin-bearing large mononuclear leucocytes present in films.

1st October, 1931.—Temperature normal. No parasites seen in either thin or thick films.

2 c.c.m. of the patient's blood was inoculated into *Macacus rhesus* (not shown in graph I). This animal was examined daily until 25th November, 1931, and never at any time showed any trace of infection.

3rd October to 10th November, 1931.—Patient kept in hospital on general tonics, etc. Temperature consistently afebrile.

10th November, 1931.—Patient discharged from hospital in good health.

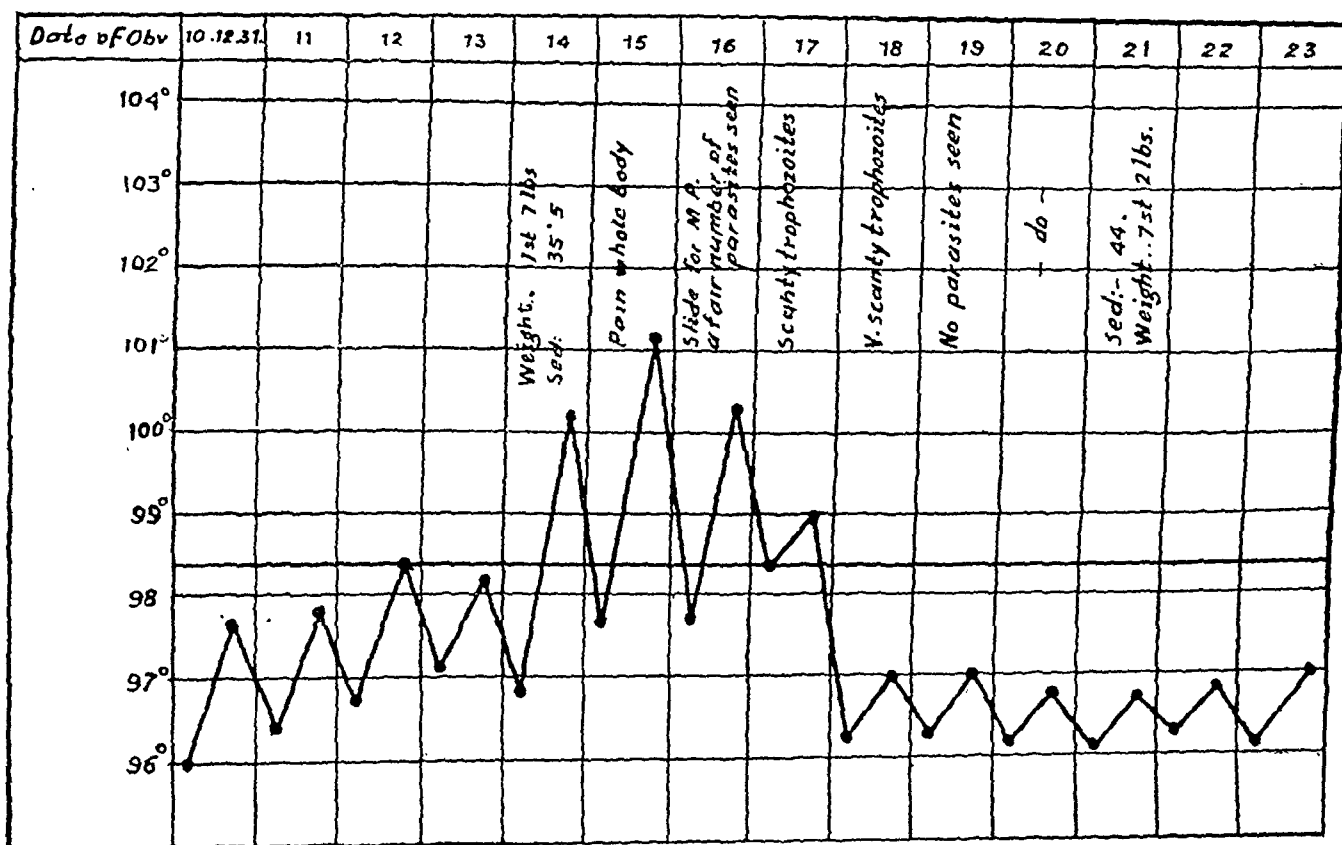
man. There appears to be here some evidence of increase of virulence of the strain on subpassage, as already noted by Napier and Campbell on page 246 of the last issue of this journal. Human volunteer V 1 received a total dose of 72,800,000 parasites and had an incubation period of 23 days; human volunteer V 2 received a total dose of 2,400,000 parasites, yet the incubation period was only 10 days.

Human volunteer V 3 of graph I (chart VI)

This patient was placed at our disposal through the kindness of Dr. E. Muir, Leprosy Research Worker, Calcutta School of Tropical Medicine. Dr. Muir holds the view that a secondary attack of fever, whether due to

CHART VI

0.1 c.c.m. of blood injected subcutaneously on 24th November, 1931, from monkey No. 23 showing a parasite count of 1,180,000 per c.mm. (growing trophozoites, schizonts and gametocytes)
Name Shashi Bhushan Maity, age 25 years. Disease Leprosy. Human volunteer V 3



It is to be noted in this case also that the fever was at first of a daily intermittent character. The patient's temperature chart and parasite findings are shown in chart V. We have previously seen similar untreated cases in a critical condition with very high fever, where the temperature has suddenly come down with a rush and the infection has immediately been exterminated or almost exterminated within 24 hours, no quinine having been administered. The very violence of the body reaction seems to utilize the body of parasites.

The patient sustained so severe an illness that the virus further in

malaria or to kala-azar, sometimes effects considerable improvement in a patient with leprosy, and asked us to induce malaria in this patient. At the time our strain of monkey-malaria was being serially passaged in *Macacus rhesus* monkeys, and had become extremely virulent, *M. rhesus* R 14 and R 15, both inoculated from R 13, having very rapidly died from a hyperacute infection, with hæmoglobinuria. We decided to use *M. rhesus* R 13 as the donor, but to give a very small dose intracutaneously. Details are as follows:—

Shashi Bhushan Maity, aged 25, Hindu male, formerly a resident of Midnapore, and an inhabitant of Gobra

Leper Hospital, Bengal. Leprosy of C 3 type and of duration five years. Nodules on face and ears, erythematous thickened patches on the body and extremities, anaesthesia over the legs and feet. Innumerable acid-fast bacilli in smears from the nasal mucosa and in a smear from a nodule on the right ear. Gives a history of syphilis two years previously, Kahn test + + +, and hookworm ova present in the stools. Spleen and liver not enlarged. From time to time has had fever whilst in the hospital, but examination of blood films on such occasions has never shown any malaria parasites present. (As Gobra Hospital is some considerable distance from the School, it was not possible to carry out a preliminary Bass culture, but there was no evidence of any latent malaria.)

24th November, 1931.—Given 0.1 c.cm. of blood intracutaneously from *M. rhesus* R 13, showing a parasite count of 1,180,000 per c.mm., schizonts, trophozoites and gametocytes.

14th December, 1931.—First rise of temperature, 99.4°F. Incubation period 20 days.

15th December, 1931.—Temperature 101.2°F. Complaints of pains all over the body.

16th December, 1931.—Temperature 100.4°F. Films taken at the hospital and sent to the School showed a fair number of parasites, rings and trophozoites. These corresponded morphologically to the 'monkey-human' type of parasite to be described later.

17th December, 1931.—Temperature 99°F. Scanty trophozoites in films.

18th December, 1931.—Temperature 97°F. Very scanty trophozoites in films.

19th December, 1931.—Temperature 97°F. No parasites seen in films.

20th December, 1931.—Temperature 96.8°F. No parasites seen in films.

Thereafter the patient ran a normal or subnormal temperature, and he is to-day free from any evidence of malaria. It is to be noted that the fever was of daily remittent type. The patient lost 5 lbs. in weight during the attack. His temperature chart and parasite findings are shown in chart VI.

In none of the three human volunteers was any quinine or other anti-malarial drug administered, and all three—even including V 2, a very severe infection—recovered from their 'monkey-malaria' spontaneously.

Discussion of these findings will be reserved till later in this paper.

Part III. The morphology of the species of *Plasmodium* concerned

In all we have studied the morphology of this parasite in 43 hosts belonging to 7 different species of Primates. Our studies in this subject—although only preliminary to much further work which lies ahead of us—have extended over nine months, and many hundreds of films have been examined. For the counts the films were stained by Giemsa's stain; for other purposes films were stained by combined Leishman's and Giemsa's stain (Knowles, 1928, p. 687).

In the present paper we do not propose to attempt to identify the species of monkey *Plasmodium* concerned. The literature on the *Plasmodia* of monkeys is like only too much of the literature in medical (and veterinary) protozoology, and can only be termed 'an unholy mess'. Some of it is even buried in inaccessible annual laboratory reports or obscure French or German veterinary journals. Worker after worker has described new species on the most slender grounds, or on no grounds at all. There

is a type of mind which delights in the creation of new species, and the chief duty which faces the honest medical protozoologist of to-day is to attempt to create order where at present chaos reigns. The senior author of the present paper has to place on record his regret that he has been responsible in his earlier and more inexperienced days for adding to this muddle (Knowles, 1919). Having discovered a severe infection with a *Plasmodium* in a moribund human monkey—*Semnopithecus entellus*—in Assam, he described the parasite as a new species, *Plasmodium semnopitheci*. What he did not realize at the time was:—

(i) that before creating a new species, it is necessary to search the whole of the previous literature, and make certain that it has not been described before. This somewhat heroic task still lies ahead of us in connection with the *Plasmodium* referred to in this paper.

(ii) that the morphological appearances of a dying blood-inhabiting protozoon in a dying host may be extremely aberrant and far from normal. Anyone who has studied blood films from a rat dying from surra will understand what we mean by this. Two hours before the rat's death the blood films are full of *Trypanosoma evansi* of monomorphic type, staining well, and showing the normal morphology of that parasite. Half an hour before the rat's death the trypanosomes in blood films are degenerating; the parabasal body and flagellum are being bodily ejected from the trypanosomes, the nucleus is breaking down into granules of varying intensity of staining reaction which fill the posterior half of the trypanosome, and hardly a single normal form is to be encountered; just before the rat's death not a single trypanosome, recognizable as such, may be encountered in the films. The parasites have died just prior to the death of their host.

'*Plasmodium semnopitheci*' is probably synonymous with some previously-described monkey *Plasmodium*, and the species dealt with in the present paper is probably identical with some species that has been (inadequately) described previously.

With regard to periodicity, this appears to be diurnal, though very much further study on this point is required. In *Cercopithecus pygerythrus* monkeys the infections are so scanty that it is impossible to determine the periodicity. In infected *Macacus rhesus*, *Semnopithecus entellus*, and human volunteers the fever tends to be of daily remittent or intermittent type—though this may not mean much, since James (1926) has shown that primary induced benign tertian malaria may show a daily periodicity in man. We tried to determine the periodicity in Bass cultures, but these become so full of growing trophozoites and schizonts at all stages of development that it is impossible to settle the point. *Macacus*

rhesus R 15 of graph I showed the following findings:—

30th November, 1931.—Count 280,000 per c.mm. at 5 p.m.—almost all young rings.

1st December, 1931, at 5 p.m.—Hyperacute infection; estimated count (as against erythrocyte count) 3,100,000 per c.mm.—only ring forms seen.

The animal died the following night.

This may perhaps indicate a 24-hour cycle, but the point requires further investigation.

In studying the morphology of this *Plasmodium*, our first finding was so amazing that it appeared to us to be incredible. In *Cercopithecus pygerythrus* the parasite is morphologically very like *Plasmodium vivax* of man; the infected red corpuscles are enlarged and pale and show Schüffner's dots very well, whilst the growing trophozoite forms are very amœboid. On the other hand, in *Macacus rhesus* the infected red corpuscles are not enlarged and show no stippling; except for the fact that the gametocytes are globular, rounded bodies and not crescent-shaped, the morphology of the parasite in *Macacus rhesus* rather recalls that of *Plasmodium falciparum* of man. In man the parasites show little or no amœboid activity, the red corpuscles are not enlarged, with Leishman's or Giemsa's stain no stippling is seen, and the general morphology rather recalls that of *Plasmodium malariae* of man.

The more we studied the subject, the more puzzled we became. One fact soon emerged; that the morphology of the parasite remained constant for the host species concerned; in *Cercopithecus pygerythrus* the morphology was invariably the same—of 'Cercopithecus type', if we may use the term; in *Macacus rhesus* the morphology was always the same—of 'rhesus type', if we may use the term; in man the morphology was always the same—of 'human-monkey type', if we may use the term.

Now there is nothing easier—or, in our opinion, more fallacious—than to make a general study of a blood film containing malaria parasites, and then to sit down and write a general account of the morphology of the parasite forms observed. This matter has been fully dealt with elsewhere (Knowles and Senior White, 1930, pp. 385–398), and we need not enter into it here. In no branch of medicine is the well-worn tag of Hippocrates more appropriate—'Experience is fallacious and judgment difficult'.

We determined, therefore, to examine the problem by standardized methods. All films examined were stained by the combined Leishman-Giemsa method, and six different infections were intensively studied. A full description of each of the first 100 parasite forms encountered in turn was written down, together with notes on the changes—if any—in the infected erythrocyte. These were then grouped in tabular form under the following headings:—

rings, i.e., very early trophozoite forms with the vacuole still present;
growing trophozoites;
schizonts, whether early or late;
mature schizont-rosettes in which the merozoites had become clearly differentiated and mature;
gametocytes.

A general account of the morphology in the infection concerned was then written out from a study of the tables*. No attempt at comparing the morphology in different hosts was made until all had been studied. At first we examined only 100 parasites per infection, but later we attempted in each infection to collect descriptions of 100 rings, 50 trophozoites, 50 schizonts and as many gametocytes as possible.

(i) *The morphology of the parasite in its original strain in Cercopithecus pygerythrus*

Cercopithecus pygerythrus C 2 of graph I was selected for this. It has shown a chronic infection with parasites present off and on for seven months, and was inoculated directly from the *Cercopithecus* which was originally discovered to have a natural infection.

The morphology of the parasite in this host is illustrated in plate I, figures 1 to 12. Plate VI, fig. 1 shows a typical growing trophozoite form.

The morphology of the parasite in *Cercopithecus pygerythrus* may be summarized in the following terms:—

The rings are very thin and hair-like. They are amœboid or very amœboid, and about one-third to one-half the diameter of the red corpuscle. They are frequently situated laterally (i.e., not accolé forms, but lying on the discoid surface of the red cell and extending to its margin). There is but little enlargement of the red corpuscle at this stage, and stippling is not much in evidence, though it may occur. Occasionally the chromatin has divided, and double infection of the erythrocyte has been noted.

The growing trophozoite forms are amœboid or very amœboid. By this time there is very definite enlargement of the infected red corpuscles, and Schüffner's dots are well in evidence. Occasional band-like forms are seen, but the shape of the growing parasite is usually quite irregular owing to its amœboid activity.

The mature schizont-rosette lies in a considerably enlarged red corpuscle with Schüffner's dots well in evidence. The hæmozoin, consisting of fine brown-black pepper-like grains, is at first scattered throughout the growing parasite, but as the schizont matures it collects into a dense black cluster situated excentrically. The merozoites—from 9 to 10 in number—are collected around it in a grape-like cluster.

The gametocytes in general resemble those of *P. vivax*. The macrogametocyte is a large globular non-amœboid body, staining deeply, and lying in an enlarged or much enlarged red corpuscle showing Schüffner's dots; its chromatin is present as a deeply-staining red mass situated laterally. The hæmozoin grains are diffusely scattered throughout the parasite. The microgametocyte is a large, globular, non-amœboid body occupying the whole of an enlarged or much enlarged red corpuscle showing Schüffner's dots. It stains badly—purplish, rather than blue. The chromatin is present as a diffuse

*The tables have not been reproduced here, owing to want of space.—EDITOR, I. M. G.

EXPLANATION OF PLATE I

The morphology of the parasite in its original strain in *Cercopithecus pygerythrus*, monkey C 2 of graph I.

- Fig. 1.—An early ring.
- Figs. 2 to 5.—Growing trophozoites.
- " 6 to 8.—Schizonts.
- Fig. 9.—A macrogametocyte.
- " 10.—A microgametocyte.
- " 11.—Macrogametocyte *plus* schizont within the same erythrocyte.
- " 12.—Schizont *plus* schizont within the same erythrocyte.

EXPLANATION OF PLATE II

The morphology of the parasite in an established strain in *Macacus rhesus*, monkey R 18 of graph I.

- Figs. 13 to 15.—Ring forms.
- " 16 and 17.—Growing trophozoites.
- " 18 to 21.—Schizonts.
- Fig. 22.—Ruptured schizont-rosette
- " 23.—Macrogametocyte.
- " 24.—Microgametocyte.

EXPLANATION OF PLATE III

The morphology of the parasite in man, human volunteer V 1 of graph I.

Figs. 25 and 26.—Ring forms.

" 27 to 29.—Growing trophozoites.

" 30 to 32.—Schizonts.

Fig. 33.—Macrogametocyte.

EXPLANATION OF PLATE IV

The morphology of the parasite in *Semnopithecus entellus*, monkey S 2 of graph I.

Figs. 34 and 35.—Ring forms.

" 36 and 37.—Growing trophozoites.

" 38 to 41.—Schizonts.

Fig. 42.—Macrogametocyte.

" 43.—Microgametocyte.

" 44.—Macrogametocyte plus macrogametocyte within the same erythrocyte.

" 45.—Macrogametocyte plus schizont within the same erythrocyte.

EXPLANATION OF PLATE V

The morphology of the parasite in *Macacus radiatus*, monkey M 3 of graph I.

Figs. 46 and 47.—Ring forms.

Fig. 48.—Growing trophozoite.

Figs. 49 to 52.—Schizonts.

Fig. 53.—Macrogametocyte.

" 54.—Microgametocyte.

PLATE III.



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PLATE IV.



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PLATE V.



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Hoy-

The morphology of the parasite as seen in man may be summarized as follows:—

The rings are compact, dense, and with considerable cytoplasm. They are either non-amœboid or only slightly amœboid. They occupy from one-third to two-thirds of the red corpuscle. The infected red cell is normal, and not enlarged. With Leishman's and Giemsa's stains no stippling is seen. On the other hand in films stained by Shute's method—(James, 1929)—a faint Ziemann's stippling, or a bronzing of the corpuscle rather than a true stippling may be seen. Not infrequently the infected cell appears to be smallish and pale; it is often crenated. The chromatin is situated as a prominent dot or blob in the thinner margin of the ring, more rarely as a curved bar, sometimes as a prominent blob within the vacuole. Hæmozoin may appear quite early in some rings.

The growing trophozoites are sometimes but little amœboid, sometimes rather amœboid, and only very rarely very amœboid. They occupy from one-half to two-thirds of the infected cell, which is never enlarged and which shows no stippling (except by Shute's method); sometimes the infected cell appears a little smallish, pale and crenated. The chromatin is usually present as a blob-like mass situated laterally, more rarely centrally, rarely as a curved bar, or as a marginal *tenue* band. Hæmozoin appears early in the form of fine, scattered brown-black grains.

The early schizonts are compact, globular, non-amœboid forms, occupying from two-thirds to three-quarters of the infected cell. At the first chromatin division, the daughter nuclei often pass to opposite poles of the parasite. In the maturing schizont the hæmozoin is frequently situated marginally, but later collects into a dense, excentric cluster. The infected red corpuscles are normal in size, often paler than normal in colour, and sometimes show a faint stippling. A feature of the schizont is that the first division of the chromatin often occurs when the parasite only fills half the red cell. The mature schizont has about 10 merozoites.

Gametocytes were extremely rare findings in the films from man. They resembled those of *P. malariae*, but were less heavily pigmented. The infected red corpuscles were neither enlarged nor stippled.

In general the infection in man resembles one with *P. malariae* in its morphology. The morphology of the parasites seen in human volunteers V 2 and V 3 conformed closely to the above description. The scanty rings and trophozoites seen in the infected *Hylobates hooleck* also corresponded to this morphology.

(iv) *The morphology of the parasite in Semnopithecus entellus*

The films selected for studying this were taken from *Semnopithecus entellus* S 2 of graph I. As will be seen from graph I, this animal was inoculated with what one may term an 'established' strain in *Macacus rhesus*—from R 21 of the graph. The films were taken on the third day after the first appearance of parasites, when the infection was a fairly heavy one. The findings are illustrated in plate IV, figures 34 to 45.

The morphology of the parasite in *Semnopithecus entellus* may be summarized in the following terms:—

The rings in general are thin and hair-like, resembling those of *P. falciparum*, but with more cytoplasm. They are amœboid or frequently distorted; a few (? pre-gametocytes) are small, dense and compact. They

occupy from one-quarter to one-half of the red corpuscle and the chromatin is characteristically present as a very prominent deeply-staining lateral dot or blob; sometimes it occurs as a curved bar in the vacuole. The red corpuscle is unchanged and normal in appearance; only very rarely is there any suggestion of enlargement of the cell; occasionally there may be basophile stippling. Accolè rings occur, but the usual position of the ring is lateral towards the margin of the red corpuscle; it may sometimes be marginal without being accolè. Early division of the chromatin during the ring stage occurs.

The growing trophozoites occupy one-half to three-quarters of the infected corpuscles. They may be globular and compact and non-amœboid, or, on the other hand, may be somewhat or even very amœboid. Band forms occur resembling those of *P. malariae*. The mass of chromatin is present as a prominent deeply-staining lateral dot or blob, sometimes as a lateral band or lateral curved rod; only rarely is it central in position. The hæmozoin is in the form of scattered brown-black grains, sometimes more developed around the margins of the growing trophozoite than in the centre. The infected red corpuscle is normal in size, usually unaltered, though it may sometimes show a suggestion of a very fine stippling.

The maturing schizonts are usually globular and non-amœboid. On the other hand the first nuclear division may take place whilst the parasite only occupies two-thirds of the cell and is still in amœboid activity; at this first nuclear division the two daughter nuclei tend to occupy opposite poles of the parasite. As the schizont matures the fine grains of pigment are especially well seen in the margins of the parasite, and later collect into a dense, excentric cluster. The mature schizont-rossette occupies the whole of the cell and has about ten merozoites, the pigment being situated in a dense excentric cluster. The infected red corpuscle is normal in size and appearance, very occasionally however suggesting pallor and very slight enlargement.

The gametocytes resemble those of *P. malariae*. They occupy the whole of a red corpuscle which is not enlarged or stippled. In the macrogametocyte the chromatin is situated as a deeply-staining lateral mass with no halo around it; the pigment is present as fine grains scattered throughout the parasite. The microgametocyte occupies the whole of an infected red corpuscle which is normal in size and staining reactions; its chromatin is present as a diffuse, badly-staining, equatorial band, whilst the pigment grains are well developed around the margins of the parasite.

The combinations macrogametocyte plus macrogametocyte and macrogametocyte plus schizont-rossette within the same erythrocyte were encountered.

It is rather hard to 'place' this morphology. It bears resemblances both to *P. falciparum* and *P. malariae*.

The morphological appearances in the other human used, S 1 of graph I—also inoculated from a *M. rhesus*—were similar.

(v) *The morphology of the parasite in Macacus radiatus*

The films selected for this study were from *Macacus radiatus* M 3 of graph I, inoculated with a 'rhesus' strain. The films were taken on the first and second days after the first appearance of the parasites, when the infection was a heavy one and the temperature oscillating between 104°F. and 104.2°F.

The appearances seen are illustrated in plate V, figures 46 to 54.

The morphology of the parasite in *Macacus radiatus* may be summarized in the following terms:—

PLATE VI

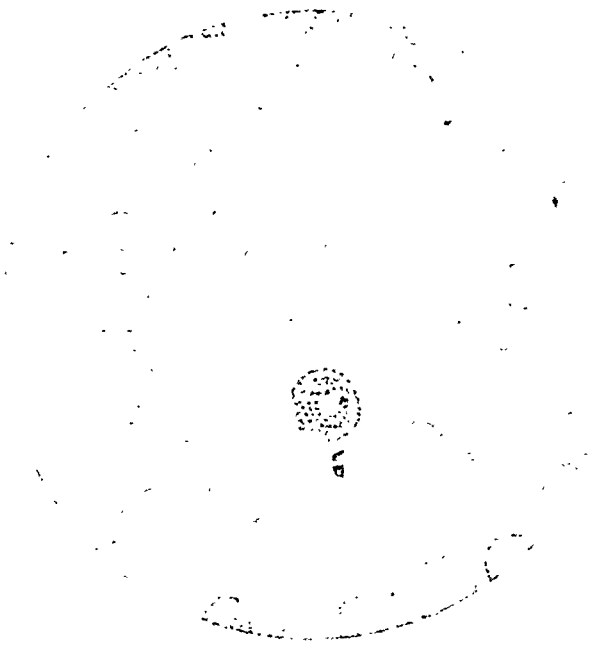


Fig. 1.—Growing trophozoite in *Cercopithecus pygerythrus*, original strain, C 1 of graph I.

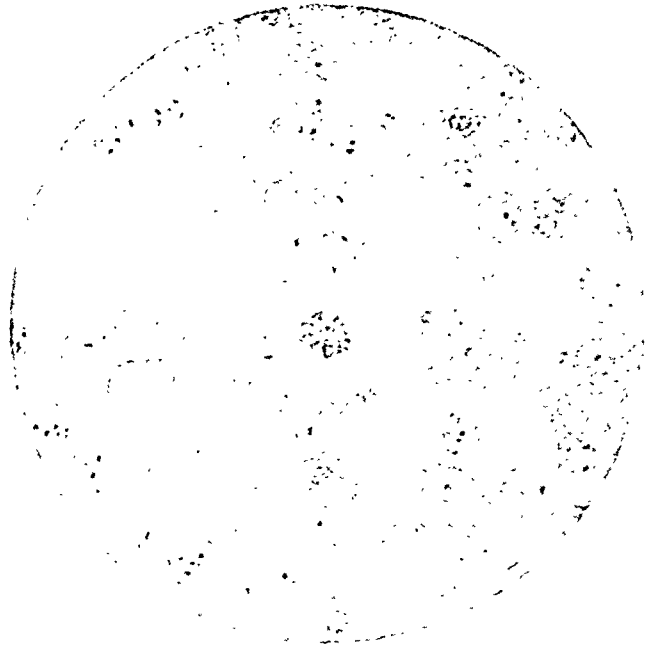


Fig. 2.—Early but moderately intense infection in *Macacus rhesus*; in the centre of the field is a mature schizont with eight merozoites and an excentric mass of jet black dense pigment.

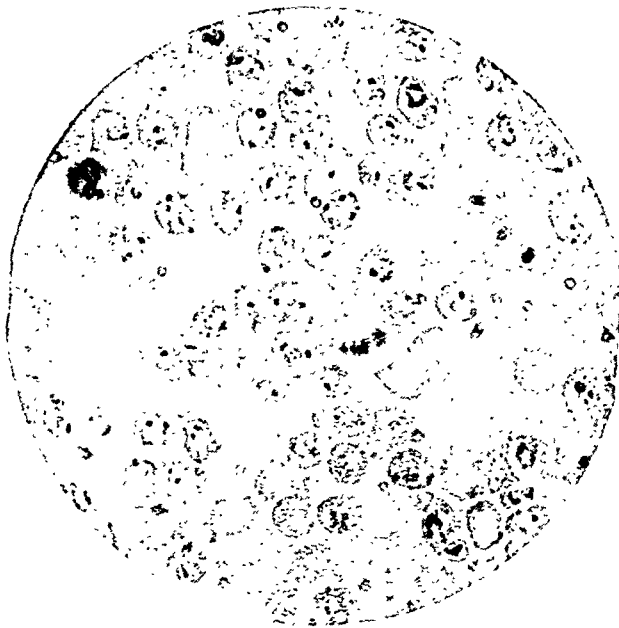


Fig. 3.—Terminal infection in *Macacus rhesus*, R 14 of graph I, taken six hours before death, at a time when the monkey was suffering from hæmoglobinuria. The intensity of the infection is terrific, some 90 per cent. of the erythrocytes being infected.

PLATE VII

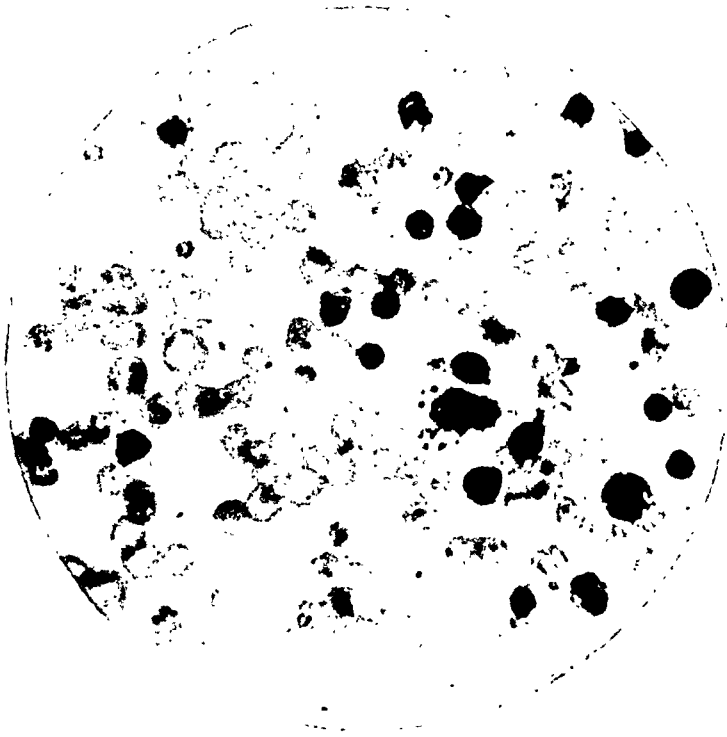


Fig. 4.—Chronic fatal infection in a *Macacus rhesus* partially but insufficiently treated with quinine. The animal showed intense anæmia; the film shows marked anisocytosis, basophilia, the presence of normoblasts, and in the centre of the field a large mononuclear leucocyte containing ingested hemozoin.



Fig. 5.—Growing trophozoite form in man; it rather resembles a trophozoite of *P. malarie*.

The rings occupy about one-third to one-half of the infected red corpuscles, which are in all cases normal in size, unchanged, and do not show stippling. In general they are thin or very thin, and hair-like, sometimes the cytoplasm is so scanty that they recall anaplastmata, rarely there is a fair volume of cytoplasm. They are amœboid, very amœboid, or extremely amœboid, and easily distorted. A few—5 per cent.—are compact and non-amœboid (? pre-gametocytes). Accolé forms are common, and the ring is often situated towards the margin of the corpuscle in a lateral position. The chromatin is characteristically present as a prominent dot or blob in the lateral aspect of the ring, more rarely as a small curved bar, exceptionally it is shaped like a minute ring. Sometimes it is placed within the vacuole. Double infection of the same erythrocyte with two rings was seen once, and early division of the chromatin is common—10 per cent. of rings show it.

The growing trophozoite forms occupy from one-half to three-quarters of the red corpuscle, which is usually normal and unchanged, but which may appear much paler than normal; there is no stippling. They are amœboid, very amœboid, or extremely amœboid; some—26 per cent.—are non-amœboid and globular (? pre-gametocytes). The chromatin is characteristically present as a dense laterally-situated mass, it may be a small laterally-placed curved bar, or a straight laterally-placed band. Egg-shaped forms recalling those of *P. malariae* are seen. The hemozoin consists of fine brown-black grains, but sometimes it is unexpectedly coarse in character. It is usually scattered throughout the growing parasite, but may be marginal in position. The vacuole may persist to an unusually late period in the growing trophozoite. Macrocytes were prominent in the films, also large hyaline macrophages containing ingested pigment; these resemble those seen in infections with *P. falciparum*, the ingested pigment being a round big black blob.

The growing schizonts occupy two-thirds to three-quarters of the infected red corpuscles, which are normal in size, but which may appear to be definitely paler than normal; there is no stippling. They are globular, non-amœboid or only very slightly amœboid forms. At the first nuclear division, the two daughter nuclei tend to pass to opposite poles of the growing parasite. The hemozoin is usually scattered throughout the growing schizont in the form of fine grains, but sometimes the grains are unusually coarse. The mature schizont-rosette was a very rare finding in the films, but resembles that seen in *M. rhesus* with about ten merozoites.

The gametocytes are large, globular, non-amœboid bodies filling red corpuscles which are usually normal and unchanged, but which may occasionally appear pale. The macrogametocyte stains deeply blue, with the pigment scattered throughout it. The chromatin is in a characteristically lateral position to one side, usually as a dense, well-staining mass, sometimes a little diffuse. Only two microgametocytes were seen. They stained badly—a diffuse reddish colour; the chromatin was diffuse, badly staining, and equatorial in position; the pigment was coarse and arranged marginally. The combination macrogametocyte plus microgametocyte within the same erythrocyte was seen once.

The morphological appearances in *Macacus radiatus* M 1 and M 4, both inoculated from *M. rhesus*, were the same; so also were the morphological appearances in *M. radiatus* M 2, although this monkey was inoculated from a *Cercopithecus pygerythrus*.

(vi) *The morphology of the parasite in Cercopithecus pygerythrus, when inoculated with an established 'rhesus' strain*

Having obtained an established 'rhesus' strain of parasites showing the typical 'rhesus' morphology, it occurred to us that it would be of interest to see what happened when this virus was passaged back into a clean *Cercopithecus pygerythrus*. This was accordingly

done, *C. pygerythrus* C 9 being inoculated with 0.25 c.cm. of blood from *M. rhesus* R 18, with a parasite count of 10,400 per c.mm.—rings and trophozoites (*vide* graph I). After an incubation period of 7 days parasites appeared in the *C. pygerythrus*, the infection persisted for 8 days, and then cleared up spontaneously (although the same strain proved fatal to *M. rhesus* R 19, inoculated from the same source). Films were taken on the second and third days after the first appearance of the parasites.

We were prepared to find in this animal that the parasites had either reverted to the 'Cercopithecus' type of morphology, or had retained their 'rhesus' type of morphology. The actual findings may be summarized as follows:—

The young rings are small, from one-fifth to one-third of the diameter of the red corpuscle. They are thin and hair-like, in general resembling those of *P. falciparum*, but with more cytoplasm; some 20 per cent. however are small, dense and compact (? pre-gametocytes). Occasionally they may be amœboid or distorted. They are very constantly lateral in position, and may reach the margin of the erythrocyte, though accolé forms were not seen. The infected red cell is usually unchanged, not infrequently it is crenated, and may even seem smaller than normal. The chromatin of the ring stands out very clearly as a big dot or blob, staining deeply.

The growing trophozoite forms show a great variety in morphology. They occupy from one-half to two-thirds of the infected cells, and may be globular and non-amœboid, slightly amœboid, or very amœboid. The chromatin is characteristically present as a single very prominent mass, situated laterally, more rarely as a lateral or central band. The hemozoin grains are usually scattered throughout the trophozoite, sometimes however they are marginal in position. The red cell is usually normal and unchanged in appearance, but it may seem pale, a faint stippling may be present, and a few appear to show some enlargement.

The growing schizont forms occupy red corpuscles which are usually normal in size and appearance, but which may be paler than normal and show a faint stippling. At the first nuclear division the two daughter nuclei move apart and come to occupy opposite poles in the growing parasite. The hemozoin is at first scattered, not infrequently marginal in position; as the rosette matures however, it collects into a dense cluster, placed excentrically. The number of merozoites is about ten. A characteristic feature of the younger schizonts is that nuclear division may set in whilst the parasite still occupies only one-half to two-thirds of the cell, and whilst it is still in amœboid activity.

The gametocytes in general resemble those of *P. malariae*, but are less deeply pigmented. The macrogametocyte fills a red corpuscle which is normal in size, but which may show a faint stippling. The chromatin is situated as a very prominent deeply-staining mass, placed laterally, with no halo around it. The hemozoin grains are scattered throughout the gametocyte. The microgametocyte stains badly, and fills a red corpuscle which may be of normal size or may appear to be slightly enlarged. The chromatin is present as a diffuse, badly-staining equatorial band, and the hemozoin grains are characteristically situated around the margins of the gametocyte.

It will be seen that, in general, the parasites tended to retain their 'rhesus' type of morphology, but in some cells there was definite enlargement of the cell, and in some definite stippling. The growing trophozoite forms were in some instances very amœboid. It may seem

ridiculous to suggest that the parasites were trying to get back to the 'Cercopithecus type' of morphology; yet it would have been of interest to have subpassaged further into *C. pygerythrus* monkeys and have seen what happened. Further work on this subject is obviously necessary, and in future experiments—instead of inoculating such monkeys as are available at the moment—it will be necessary to collect sufficient monkeys of each species in turn and to work along systematic lines.

* * * * *

General remarks on the morphology of the parasite

We have given above the collected data and the observed facts. Their interpretation is not easy. For the sake of comparison we have grouped the morphological findings in tabular form in table I, p. 318.

Before we proceed any further, we may answer two criticisms which are certain to be made.

(i) *That we were dealing with a mixed infection.*

This is certainly not the case. In the original host from which the virus came—*Cercopithecus pygerythrus* C 1 of graph I—the parasites were so scanty that it was at first difficult to make certain that the infection was one with a *Plasmodium*, and neither a piroplasma nor an artefact. *C. pygerythrus* C 2 was inoculated directly from C 1. It has shown the infection off and on for seven months, and the parasites throughout have retained their 'Cercopithecus' morphology. In the three *C. pygerythrus* C 3, C 4 and C 8 inoculated directly from C 2, the parasites retained their 'Cercopithecus' morphology, and the infections were of the characteristic chronic nature with low counts and spontaneous recovery (C 3 would almost certainly have recovered without any quinine). On the other hand in the four *Macacus rhesus* inoculated from C 2—viz, R 1, R 3, R 5 and R 17—the infections were morphologically of 'rhesus type', and all proved fatal. It is not so much the morphological strain of parasite inoculated, as the species of host which receives it, that determines the morphology.

Further, had we been dealing with a mixed infection, it is certain that one or other species of parasite would have come to predominate at the expense of the other. This is the rule in mixed infections in human malaria, and will presumably apply also in monkey-malaria. Even in Bass culture, which is an extremely delicate test as a rule for the presence of mixed infections, no evidence of mixed infection was detected. We paid particular attention to this point, for we realized that the presence of a mixed infection might explain the findings. We are driven to the conclusion, however, that we are dealing with infection by a single species of the genus *Plasmodium*, the natural host of the parasite being the African monkey *Cercopithecus pygerythrus*.

(ii) *That we were dealing with latent malaria in some of the 43 hosts used in graph I, and that the inoculations awakened this latent malaria into activity.*

This, again, is certainly not the case. In all hosts used (with the exception of human volunteer V 3) thin and thick blood films were examined and all these proved negative. We have already mentioned our previous want of success when searching batches of *M. rhesus* purchased locally for natural plasmodia of their own. Also it is incredible that 43 consecutive Primate hosts belonging to 7 different species should all have had a latent and undetected malaria infection of their own. We have taken every possible precaution to use only 'clean' hosts.

This being the case, we are faced with what we believe to be an entirely new problem in protozoology, if not in parasitology generally. Analogies are dangerous, and for the time being we may stick to the genus *Plasmodium*. But, given a single species of *Plasmodium*, inoculated into and 'taking' in hosts of different genera and species in the suborder Anthropeidea, we see that in such hosts there occur very great differences in (i) susceptibility or resistance to infection, associated with (ii) great differences in the morphology of the parasite itself.

Whatever the explanation of these findings, the problem is obviously one requiring much further and more systematic study. In passing, it may be noted that three factors appear to vary simultaneously, viz—(i) enlargement or non-enlargement of the erythrocytes, (ii) the presence or absence of stippling in the erythrocytes, and (iii) the amœboid or non-amœboid activity of the trophozoite phase.

Presumably parasites of the genus *Plasmodium* are at first applied to the discoid surface of the erythrocytes, but as they grow the growing trophozoites enter into the interior of the erythrocytes. If we might postulate slight differences in the internal viscosity or osmotic pressure within the erythrocytes of *Cercopithecus pygerythrus*, *Macacus rhesus*, and man, respectively, this might account for the differences in morphology of the parasite in these three hosts. But other explanations are possible, and it is obvious that much further study of the problem is required.

Part IV. Discussion

Long as this paper is, we cannot bring it to a conclusion without briefly commenting on some of the very numerous problems and possibilities which arise from this preliminary study of the subject.

(i) As a mere side line, the establishment of this strain of monkey-malaria in our department provides magnificent material for teaching post-graduate students. In teaching students, it is essential to present the parasitic and entozoic protozoa of man as merely a few members of a very much wider group of closely allied protozoa, parasitic or entozoic in a very wide range of other animal hosts. The latter often provide much fresher and better material for class study than can be obtained from man,—e.g., from post-mortem material.

(ii) The whole histo-pathology of slight infections, of relapsing infections, and of hyper-acute infections could well be studied with this strain of monkey-malaria. This is a piece of work which we are not competent to undertake.

(iii) Using monkeys of different genera and species, questions relating to differences in racial immunity or susceptibility to malaria could well be studied. The causation of relapses could also be investigated.

(iv) The problems of the ætiology and pathogenesis of blackwater fever could be investigated in an experimental animal—*Macacus rhesus*.

(v) Enumerative and cultural studies on this strain of monkey-malaria might throw considerable light on some of the many unsolved or only partially-solved problems in human malaria.

(vi) The question of anopheline transmission of this infection will certainly have to be taken up. So far we have only dealt with animals infected by direct inoculation with infected blood.

These are only a few of the many possibilities for study that appear to open out. It will probably be months (or years) before we shall be in a position to publish any further communication on this subject; and it is for this reason that we have decided on the publication of this preliminary memoir.

Part V. Summary

(Here we prefer to use the word 'summary' rather than 'conclusions', since we are at present far from having arrived at any conclusions.) In all, we have studied this strain of monkey-malaria in 43 hosts belonging to 7 different species of Primate. All were infected by inoculation with infected blood.

(i) The parasite occurs as a natural infection of the African monkey *Cercopithecus pygerythrus*. In this host the infections are scanty and either spontaneous recovery occurs within a few days or weeks, or a very light infection persists off and on for periods up to seven months at least. There are no symptoms of disease. Morphologically, the parasites closely resemble *P. vivax* of man, and gametocytes are relatively abundant.

(ii) In *Macacus rhesus*, no matter from what infected blood inoculated, matters are entirely different. This species is exceedingly susceptible, and the infection is invariably fatal—usually within a week or less of the first appearance of parasites. *M. rhesus* can be infected with an extremely minute dose—e.g., a total inoculation of only 16,000 parasites. There is fever rising to 106.2°F., with profound and progressive anæmia. All phases of schizogony are seen in the peripheral circulation, whilst the terminal phases of infection are of terrific intensity, with parasite counts up to 3½ million parasites per c.mm. The internal viscera are crammed with infection. Morphologically the earlier ring and trophozoite phases bear some resemblance to *P. falciparum* of man, whereas the gametocytes resemble those of *P. malariae*. The infected red corpuscles are not enlarged and not stippled. Pigment-bearing macrophages are a prominent feature of the infection, whilst the mature schizont-rosette has about ten merozoites arranged in a grape-like cluster around an excentrically-placed clump

of pigment. Death occurs after a sudden fall of the temperature to subnormal.

(iii) The terminal infection in *Macacus rhesus* is sometimes accompanied by hæmoglobinuria. This finding may render it possible to study the ætiology and pathogenesis of blackwater fever in an experimental animal.

(iv) In *Macacus radiatus* the infections are scanty and persist for from 5 to 40 days; parasite counts are low, and spontaneous recovery the rule. There are no symptoms of illness. Morphologically, the parasites occupy an intermediate position between *P. falciparum* and *P. malariae*; the growing parasites are amœboid or very amœboid, the red corpuscles unchanged, the hæmozoin often coarse, and the gametocytes resembling those of *P. malariae*.

(v) *Semnopithecus entellus*—the 'hunuman' monkey of Assam—is very susceptible. Severe infections occur, with parasite counts up to 728,000 per c.mm. and fever to 105°F. Severe and progressive anæmia develops and the animals become very ill; both those inoculated died of lobar pneumonia as a secondary infection. Morphologically the parasites show resemblances to both *P. falciparum* and *P. malariae* of man; the red corpuscles are unchanged in size but may show a faint Ziemann's stippling with Shute's technique. This species appears to be nearly as susceptible as *M. rhesus*.

(vi) *Hylobates hoolock*—the 'hoolock' anthropoid of Assam—is only slightly susceptible and shows only a transient infection for a few days unaccompanied by any symptoms. Only the ring and trophozoite phases of the parasite were seen in this host, and they resembled those of *P. malariae* in man.

(vii) The infection has been successfully transmitted to three human volunteers, viz:—

V 1, in whom a mild grade of fever occurred with a tendency to a diurnal remittent chart, and a maximum febrile rise to 101.8°F. After a very mild relapse this patient showed spontaneous recovery.

V 2, a subpassage from V 1. This patient showed a very severe attack of malaria with the temperature rising to 104.2°F., and thereafter a sudden drop to subnormal, accompanied by extermination of the parasites and spontaneous recovery.

V 3, in whom there was only a mild daily remittent fever lasting for four days, followed by spontaneous recovery. In all three infections spontaneous recovery occurred without the administration of quinine (or any other antimalarial drug). Morphologically the parasites rather resembled *P. malariae* of man, and gametocytes were a very rare finding.

(viii) In *Cercopithecus pygerythrus* inoculated with an established strain from *Macacus rhesus*, the parasites tended to retain their 'rhesus type' of morphology, but the amœboid character of the trophozoites and occasional enlargement and stippling of the erythrocytes

TABLE I
Comparative morphology in different hosts

	Cercopithecus, original strain	<i>M. rhesus</i> , established strain	Man from <i>M. rhesus</i>	<i>Sennopithecus entellus</i> from <i>M. rhesus</i>	<i>M. radiatus</i> from <i>M. rhesus</i>	Cercopithecus from <i>M. rhesus</i>
Size General characters.	1/3 to 1/2 R. B. C. diam. Very thin and hair-like. Amœboid or very amoeboid, many distorted. 7 per cent. compact, globular. (? pre-gametocytes).	1/3 to 1/2 R. B. C. diam. Thin, like <i>P. falciparum</i> , but with more cytoplasm. Amœboid, many distorted. 18 per cent. small, compact, globular. (? pre-gametocytes).	<i>Rings.</i> 1/3 to 2/3 R. B. C. diam. Compact, dense, with much cytoplasm, resemble <i>P. malariae</i> . Few only amœboid.	1/4 to 1/2 R. B. C. diam. Thin, hair-like, resemble <i>P. falciparum</i> , but more cytoplasm. Amœboid or very amoeboid, many distorted. 12 per cent. small, compact, globular. (? pre-gametocytes). Usually lateral in position. Accolé forms, 5 per cent. Double infection of R. B. C. occurs.	1/3 to 1/2 R. B. C. diam. Thin or very thin, hair-like, amœboid or extremely amoeboid, frequently distorted. Cytoplasm often very scanty. 5 per cent. small, compact, globular.	1/5 to 1/3 R. B. C. diam. Thin, hair-like, resemble <i>P. falciparum</i> , but more cytoplasm, amœboid, many distorted. 20 per cent. small, compact, globular. (? pre-gametocytes).
Situation on R. B. C.	Frequently lateral. Accolé forms not seen. Double infection of R. B. C. occurs.	Frequently lateral. Accolé forms rare, 1 per cent.* Double infection of R. B. C. 3 per cent.	Nothing characteristic. Accolé forms not seen. Double infection of R. B. C. occurs.	Usually lateral in position. Accolé forms, 5 per cent. Double infection of R. B. C. occurs.	Frequently lateral. Accolé forms, 3 per cent. Double infection of R. B. C. occurs.	Usually lateral in position. Accolé forms not seen. Double infection not seen.
Chromatin	Prominent dot or blob. Occasional early division.	Prominent dot or blob. Sometimes as curved bar in vacuole. Two chromatin dots in 46 per cent., three chromatin dots in 3 per cent.	Prominent dot or blob. Sometimes curved bar in vacuole, sometimes marginal band, occasional early division, 2 per cent.	Prominent dot or blob. Sometimes as curved bar in vacuole. Two chromatin dots in 17 per cent.	Prominent dot or blob, more rarely curved bar, inside vacuole in 16 per cent. Two chromatin dots in 10 per cent.	Prominent dot or blob, sometimes curved bar. Divided chromatin not seen.
Infected R. B. C.	About 25 per cent. enlarged and some show Schüffner's dots. 75 per cent. normal.	Unchanged, no enlargement, no stippling.	Normal, no enlargement, no stippling, sometimes a little pale, sometimes crenated.	Normal, no enlargement, no stippling. May be basophile at times.	Unchanged, no enlargement, no stippling.	Normal, no enlargement, no stippling. Sometimes small and crenated.
Size General characters.	1/2 to 3/4 R. B. C. Amœboid or very amoeboid, shape irregular. Occasional band-like forms encountered.	About 2/3 R. B. C. Non-amœboid or only very slightly amoeboid. Egg-shaped and band-like forms seen, resembling <i>P. malariae</i> .	<i>Trophozoites.</i> 1/2 to 2/3 R. B. C. Slightly or somewhat amoeboid.	1/2 to 3/4 R. B. C. Very variable, some globular and non-amœboid, others somewhat or very amoeboid.	1/2 to 3/4 R. B. C. Amœboid or extremely amoeboid. 26 per cent. globular, non-amœboid. (? pre-gametocytes). Egg-shaped forms seen.	1/2 to 2/3 R. B. C. Very variable, some globular and non-amœboid, others slightly or very amoeboid.
Chromatin	Usually as dense mass, excentric in position.	Blob-like mass lateral in position. Sometimes as lateral band, <i>tenue</i> -like forms seen.	Blob-like mass, usually lateral, sometimes central. Rarely as curved bar or marginal <i>tenue</i> -like form.	Prominent lateral mass, sometimes lateral band or curved rod. Rarely central in position.	Dense, laterally situated mass. Sometimes lateral curved rod or straight band.	Prominent lateral mass, sometimes lateral or central band.
Hemozoin	Scattered fine brown-black grains.	Scattered fine brown-black grains.	Scattered fine brown-black grains.	Scattered fine, brown-black grains; sometimes marginal in distribution.	Scattered fine brown-black grains; sometimes marginal in distribution, sometimes unexpectedly coarse.	Scattered fine brown-black grains; sometimes marginal in distribution.

Infected R. B. C.	Invariably enlarged. Schüffner's dots very prominent.	Unchanged; some appear pale and smaller than normal. No enlargement, no stippling, or sometimes very faint stippling.	Unchanged and unchanged. A few appear to show a very fine stippling.	Usually normal and unchanged. No stippling. Some appear to be paler than normal, 24 per cent.	Usually normal and unchanged. A few appear to show enlargement, and some show a faint stippling.
Size	Occupies almost whole R. B. C. before schizont sets in.	Occupies almost whole R. B. C. before schizont sets in.	Occupies 2/3 to 3/4 of R. B. C. before schizont commences.	Occupies 2/3 to 3/4 of R. B. C. before schizont commences.	Occupies 2/3 to 3/4 of R. B. C. before schizont commences.
General characters.	At first amœboid; later globular, non-amœboid.	Globular, non-amœboid.	Globular, non-amœboid.	Globular, non-amœboid or only very slightly amœboid.	At first amœboid or very amœboid; later globular, non-amœboid.
Chromatin	2 to 10.	2 to 10.	2 to 12. Nuclear division may set in early, whilst parasite is still amœboid. At first division daughter nuclei tend to pass to opposite poles.	2 to 9. At first nuclear division, daughter nuclei tend to pass to opposite poles.	2 to 10. Nuclear division may set in early, whilst parasite is still amœboid. At first division daughter nuclei tend to pass to opposite poles.
Hemozoin	At first fine scattered grains; later in dense excentric cluster.	At first fine scattered grains; later in dense excentric cluster.	At first fine scattered grains, often marginal in position. Later in dense excentric cluster.	At first scattered grains, some of which are unusually coarse.	At first fine scattered grains, sometimes marginal in position. Later in dense excentric cluster.
Mature schizont-rosette.	9 to 10 merozoites in grape-like cluster. Pigment in dense black excentric clump.	8 to 11—usually 10—merozoites in grape-like cluster. Pigment in dense black excentric cluster.	10 merozoites in grape-like cluster. Pigment in dense black excentric cluster.	(Not seen).	9 to 10 merozoites in grape-like cluster. Pigment in dense black excentric cluster.
Infected R. B. C.	Enlarged, often much enlarged. Schüffner's dots well seen.	Normal, not enlarged, no stippling. May be smaller and paler than normal.	Size normal. Often may appear pale and slightly enlarged. No stippling.	Size normal. May be paler than normal, 56 per cent. No stippling.	Size normal. Often may appear pale. A very faint stippling seen in some.
Microgametocyte.	Globular, non-amœboid, fills R. B. C., stains badly, chromatin diffuse, as equatorial band, pigment marginal. R. B. C. enlarged or much enlarged. Schüffner's dots very prominent.	Globular, non-amœboid, fills R. B. C., stains badly, chromatin diffuse, as equatorial band, pigment marginal. R. B. C. normal size, no enlargement, no stippling.	Globular, non-amœboid, fills R. B. C., stains badly, chromatin diffuse, as equatorial band, pigment marginal. R. B. C. normal, no enlargement, no stippling.	Globular, non-amœboid, fills R. B. C., stains badly, chromatin diffuse, as equatorial band, pigment marginal, coarse. R. B. C. normal size, sometimes pale, no enlargement, no stippling.	Globular, non-amœboid, fills R. B. C., stains badly, chromatin diffuse, as equatorial band, pigment marginal. R. B. C. normal, or slightly enlarged; no stippling.
Macrogametocyte.	Globular, non-amœboid, fills R. B. C., stains deeply; chromatin as dense lateral mass. Pigment scattered. R. B. C. enlarged or much enlarged. Schüffner's dots very prominent.	Globular, non-amœboid, fills R. B. C., stains deeply, chromatin as dense lateral mass. Pigment scattered. R. B. C. unchanged, no enlargement, no stippling.	Globular, non-amœboid, fills R. B. C., stains deeply, chromatin as dense lateral mass. Pigment scattered. R. B. C. normal, no enlargement, no stippling.	Globular, non-amœboid, fills R. B. C., stains deeply, chromatin as dense lateral mass. Pigment scattered. R. B. C. normal size, sometimes pale, no enlargement, no stippling.	Globular, non-amœboid, fills R. B. C., stains deeply, chromatin as dense lateral mass. Pigment scattered. R. B. C. of normal size, may show a faint stippling.

* Accolè forms rare in early phase of infection, but very numerous in terminal phase.

appeared to show a tendency towards reversion to the 'Cercopithecus type' of morphology.

(ix) Whilst there is great variation in the earlier phases of the infection in hosts of different species, the mature schizont-rosettes are fairly constant in morphology with about ten merozoites. The gametocytes resemble those of *P. malariae* in all hosts, except in *C. pygerythrus* where they resemble those of *P. vivax*.

(x) The extreme differences in susceptibility of hosts of different genera and species, accompanied by very considerable differences in parasite morphology, suggest that further investigations with this strain of parasite in simian hosts may throw considerable light on the problem of racial susceptibility or immunity to malaria, and on other unsolved or only partially-solved problems in malaria.

Acknowledgments

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A PRELIMINARY NOTE ON THE ANTIRACHITIC VALUE OF SUN-IRRADIATED YEAST*

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Introduction.—In northern India, rickets in its various forms, osteomalacia, late rickets and infantile rickets, tends to occur both in rural and urban areas wherever there is extreme deficiency of diet or sunlight, or more frequently where there is a relative deficiency in both these factors. Improvement in diet leads to improvement in symptoms only when sunlight is available and, conversely, the provision of sunlight for cases on deficient diet is of little avail. An analysis of 400 urban cases of late rickets and osteomalacia shows that about half the patients live under social conditions which do not admit of an altered mode of life and tend to relapse after treatment owing to want of sunlight and of a balanced dietary, while in rural areas field workers suffering from late rickets and osteomalacia, though obtaining adequate sunlight, are not in an economic position to improve their dietary deficiencies. There is, therefore, great need for a cheap and efficient means of prevention or cure. Previous work has shown the benefit that follows administration of a calcium-phosphorus salt in those cases of late rickets and osteomalacia suffering from deficient diet who can move about in sunlight, but for those who are crippled or who are deficient in both diet and sunlight the addition of some form of vitamin D is also necessary as calcifying substance, and in its absence utilization of calcium and phosphorus is impaired.

The usefulness of the administration of dried bakers' yeast (*Saccharomyces cerevisiae*) after irradiation by ultra-violet rays in the treatment of various forms of rickets has been recorded in Europe and America by different observers.

In this preliminary communication are described the results of treatment with a dried yeast powder prepared in India, and irradiated in direct sunlight.

Methods.—Considerable difficulty was experienced in finding a suitable source of yeast in India. I am much indebted to Dr. E. M.

*From the Osteomalacia Enquiry, Indian Research Fund Association.

M. Hume, p.s.c., and also to Dr. K. Coward, p.s.c., for suggestions as to modes of procedure. The method of producing a fine yeast powder suitable for irradiation was worked out at the Amritsar Distillery*. Facilities being absent in north India for the irradiation of large quantities of this material by ultra-violet rays, it was decided to experiment with exposure of the yeast powder (consisting of the product of several varieties of yeast) in a very fine layer to the action of direct sunlight for eight hours, after which the sun-irradiated yeast was stored in tins.

Patients chosen for this therapeutic experiment were known to be living on deficient diet and obtaining but little sunlight. Before treatment, the clinical condition of each patient was classified according to the degree of severity +, ++, +++, these headings being comparable to those used in previous records, and depending on the incidence, situation and amount of pain and deformity. After various trials drachm one of the sun-irradiated yeast powder, taken four times daily in either milk or water, proved to be a suitable dose for an adult. (Very occasionally patients complained of nausea in which case the dose was reduced.) Control cases received cod-liver oil drachms 2 daily.

Results.—The effect of treatment with four drachms daily of sun-irradiated yeast for four weeks is shown in the following table.

TABLE I

	+++	++	+	Nil.	Total cases.
Before treatment, degree of severity of clinical condition.	7	6	1	..	14
After four weeks treatment, degree of severity of clinical condition.	..	4	8	2	14

These patients put on weight and their general nutrition was improved at the end of four weeks, but five additional cases, who failed to take an adequate daily quantity of yeast, did not show any alteration at the end of the experimental period.

Discussion.—Fourteen patients, suffering from late rickets and osteomalacia, and living under conditions of deficient diet and sunlight, whose symptoms the use of a calcium-phosphate salt had not improved, showed decided improvement in their clinical condition after treatment with four drachms daily of powdered sun-irradiated

yeast. Smaller doses, tried in five cases; failed to give relief. (The yeast used was a waste product, left over in distillery vats after fermentation, the only previous users being cow-herds, among whom the contents of the distillery-outflow tank had a reputation for curing sick cattle.)

The improvement in the nutrition of patients after treatment indicates also the value of the vitamin B content of the yeast.

Summary.—1. The possibility of utilizing waste yeast from Indian distilleries after sun-irradiation in the treatment of late rickets and osteomalacia is discussed.

2. It is suggested that such yeast may also be useful as a source of vitamin B in nutritional disorders.

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MUSK: ITS PHARMACOLOGICAL ACTION AND THERAPEUTIC USES

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THE term 'musk' is loosely applied to a number of products of both animal and vegetable origin characterized by the peculiar odour of the true perfume. Musk proper is the dried secretion from the preputial follicles of the musk deer or *Moschus moschiferus*. The animals are found in China, Russia, Assam, Central Asia and in the pine forests and inaccessible cliffs of the Himalayas at elevations of about 8,000 feet. Musk is found in these animals only in the rutting season and is undoubtedly for the purpose of attracting the female. The season during which musk is present in the skin gland covers about one month, and in order to secure the valuable secretion of the gland the animal must be caught in that period. No musk is obtainable from animals in the other seasons of the year. The contents of the pod vary in bulk with the age of the animal. A yearling yields scarcely any musk and a two-year old fawn has in its skin gland contents one-eighth of an ounce of musk, which is milky, and has an unpleasant smell. A full-grown buck gives about two ounces, but specimens containing one-third to one-half of an ounce of musk are

* *Process of manufacture.* Yeast left over in the vats after the fermentation of molasses has been completed is washed, passed through a press and dried in the sun. It is then crushed in a disintegrator using a very fine screen, and again re-screened in order that the product may be in the form of a fine powder.

not uncommon. The material is found embedded in a sac which is oval or round with a diameter of about $1\frac{1}{2}$ inches; the upper surface is flat with a smooth membrane and the under surface is covered with stiff hairs arranged concentrically round a small opening. Though the quantity is small, the odour is so strong that it can be perceived at a distance when the animal is shot and it is said that the hunters very frequently suffer from the strong odour emanating from the fresh musk and that it acts deleteriously on the nervous system, eyesight and hearing. Chinese traders say that the best kind of musk is not obtained from captured animals, but is gathered from the favourite haunts of the deer after the rutting season, when the animal breaks the gland with its hoofs and empties the contents on the ground. Musk of this kind is extremely difficult to find and is, therefore, rarely seen on the market.

MUSK IN THE ANIMAL AND VEGETABLE KINGDOMS

It is interesting to note that odorous substances of the nature of musk occur both in the animal and vegetable kingdoms in different parts of the world. According to Gerardin (1928) the following animals secrete musk or similar odorous substances:—the male musk deer, *Moschus moschiferus*; also the gazelle, *Antilope dorcas*, the marten, *Mustela foina*, the faeces of which are said to have a musk-like odour; the alpine goat, *Capra ibex*, the dried blood of which smells like musk; the musk ox, *Ovibos moschatus*, which disseminates a decided musk odour and the meat of which, though it has a repulsive odour and taste, is eagerly eaten by the American-Indians; the zebu, *Bos indicus*; the pecari, *Dicotyles torquatus*; the musk-duck, *Anas moschata*, which is found on the Gold Coast, in Jamaica and Cayenne; the desman, *Myogal moschata*; the Nile crocodile, *Crocodilus vulgaris*; various turtles, e.g., *Cinosternon pennsylvanianum*; and various Indian snakes.

The musk odour is also found quite commonly in the vegetable kingdom. It is found in:—*Malva moschata* and the seeds of *Hibiscus abelmoschus* (*Malvaceae*); *Brassica oleracea* var. *capitata* (*Cruciferae*); *Erodium moschatum*, and *Geranium triste* or *Pelargonium noctuolens* of western Africa which is odorous at night (*Geraniaceae*); *Rosa moschata* (*Rosaceae*); the wax gourd, *Benincasa cerifera*, and the Indian bottle gourd, *Lagenaria vulgaris* (*Cucurbitaceae*); *Adoxa moschatellina* (*Caprifoliaceae*); *Achillea moschata*, *Aster argophyllus*, and *Moschardia pinnatifida* of Chile (*Compositae*); *Hyssopus officinalis*, and *Moschosma* species of India and Africa (*Labiatae*); *Mimulus moschatus* of Chile and North America (*Scrophulariaceae*); *Moschoxylon swartzii*, the musk wood of Jamaica (*Meliaceae*); *Guarea grandiflora* of America and the poisonous *Serjania curassavica* of America (*Sapindaceae*); the wood of the American *Clusia eluteria* (*Clusiaceae*); the Asiatic *Lawsonia inermis* (*Lythraceae*); the East Indian *Ferula Sumbul* (*Umbelliferae*); the wood of *Cordia Rumphii* of Java (*Boraginaceae*); *Petalium murex* or *Peturaga Cingul* of Ceylon (*Petalineae*); *Cestrum nocturnum* of South America (*Solanaceae*) and the Mexican wonderflower *Mirabilis longiflora* (*Nycoginiaceae*), the last two named exhaling a musk odour at night.

Despite the large number of products capable of affording more or less a musk-like odour, the musk deer remains the only important commercial source of this substance.

Preparation of musk for the market.—There are several ways of preparing the commercial musk, and the best method is to dry the pod by sunning and airing immediately after it is taken from the animal. The article, because of its powerful diffusion of odour, is

usually packed in hermetically-sealed vessels and wooden boxes lined with tin foil. The pods from the places of production are always packed in small skin bags singly, the pod inside the bag being covered with the animal's hair or similar stuff to keep its odour from diffusion as well as to protect it from the influence of the weather. For home consumption Chinese traders occasionally pack the pods in silk-wrapped packages of two or three dozens each. Musk is collected from the hunters by a class of trader, who is also engaged in exporting medicinal herbs and other products of the highlands of the Szechwan-Tibetan border, no Chinese merchant being engaged exclusively in the musk trade.

Commercial varieties.—There are three kinds of musk to be distinguished in commerce. (1) The Russian musk. This variety possesses a poor fragrance and hence is not much esteemed. (2) The Assam musk. It has got a very strong odour and fetches a much higher price than the other variety. In books on Hindu medicine Assam musk is described as 'Kamrup musk'. It is black in colour and has been considered to be the best variety available. At present the (3) Chinese musk is most highly prized because of its freedom from any unpleasant smell suggestive of ammonia which is sometimes found in the inferior brands. The bulk of the musk exported from China comes from Tibet, the home of the musk deer. It is bought up by the musk dealers of Tatsienlu, and carried to Chungking. The variety of musk known in commerce as 'Tonkin-musk' and chiefly used in perfumery comes from western Szechan and the eastern extensions of the Tibetan high plateau. Prior to the opening of steamer traffic on the Yangtse river in the past century, this variety of musk was exported via Tonkin to the South, it has retained the name Tonkin-musk to this day. The chief market for this article in the interior is located in the city of Tatsienlu, close to the border of Tibet. In the province of Yunnan a certain quantity of musk is also obtained but it plays no rôle in commerce. A larger quantity comes to the market from the northern parts of Mongolia and Manchuria and from eastern Siberia. This musk is known by the designation 'cabardine' but is not used for first-class products because of its penetrating unpleasant odour.

Adulteration of musk.—On account of the great demand for musk and the difficulty of obtaining it, it is very frequently adulterated with inert substances such as dried blood, liver, etc. Vegetable products such as beans, wheat, barley, etc., are also mixed with the commercial article at the time of preparing. Musk quickly imparts its peculiar scent to other substances with which it comes in contact and detection of adulteration from smell is difficult. Several methods are in vogue amongst the Chinese and Tibetan dealers which, though not very scientific, are said to afford fairly good indications as to the genuineness of the article. Whenever any doubt exists, a few grains are extracted from the pod and placed in water. If these remain granular, the musk is genuine, and if these melt the musk is false or adulterated. Another test is to place a few grains on a live piece of charcoal. If they melt and bubble, the musk is pure; if they at once harden and become cinders it is adulterated. Genuine musk even when buried does not change its odour, while impure or adulterated musk gives out an entirely different smell. Adulterated musk can also be detected by touch. Genuine musk is soft and adulterated musk is stiff to the touch. An interesting popular test for musk has been reported from the Punjab. A thread is passed through asafoetida and then through the musk pod. If after this, the smell of asafoetida remains, the musk is not genuine.

Artificial musk.—Since musk fetches a high price on the market, the unfortunate little animal—the musk deer—has been ruthlessly hunted for its valuable scent pod. Fear has been expressed by foreign naturalists for the early extinction of the animal if the present rate of destruction is allowed to go on without any restriction. It is estimated that at least twenty-two pods are required to make one 'catty' of musk (thus twenty-

two male deer must be killed before the trade can bring one catty of musk pods to the market). As the musk sac is found on the abdomen of the buck only, and there is no distinction in appearance between the male and the female deer when seen at a distance many more animals of both sexes must be caught or killed, in order to secure a catty of musk pods. As the animals are hunted or trapped during the rutting season they are getting exterminated and this fact, coupled with the increasing consumption in perfumery of the article in France, has led the chemists to look for some substitute of the natural article which can be prepared in the laboratory. Compounds having the odour of musk have been prepared synthetically but such substances have entirely different chemical structure. These are not poisonous and are largely substituted in the cheaper forms of perfumery for the expensive natural product. The musk substitutes at present known are trinitro-meta-tertiarybutyltoluene and the corresponding compounds obtained from the homologues of toluene and the dinitro derivatives of the ketones which are formed by the interaction of acyl chlorides on derivatives of toluene. Trinitro-butyltoluol, $C_6H_5NO_2$, CH_3 , C_4H_9 , has been considered to be the best. Its odour is very akin to the natural musk and it is sold in perfumery under the name of artificial musk.

Commercial importance of musk.—Musk is very largely used in India and in the Far East. Besides its medicinal use, musk is employed extensively in perfumeries. France is the largest buyer, taking about one-third of the exports. Some idea of the commercial importance of musk can be obtained from the fact that the annual value of the exports from China alone varies between £70,000 and £100,000, to say nothing of the large quantity which is retained in China itself, where it is used not only as a base for perfumes but as an ingredient of stimulating medicines. It is said that some years ago the lamas of Tsarung in south-east Tibet, owing to the relentless killing of the musk deer, issued an edict prohibiting hunters from catching or killing the animal on very severe penalty. The edict is quoted as saying that any hunter caught killing musk deer will have his hands cut off and nailed on the temple door. In spite of the lamas' decree, with its terrible penalty, the quantity of musk brought out from the Tibetan border every year is fairly large.

A good deal of musk is also exported to the United Kingdom and other parts of the globe from India. According to Watt, the total amount of musk exported from India during a period of ten years from 1878 to 1888 was 44,195 ounces worth about Rs. 11,17,579.

Composition and physical and chemical characters.—Musk when fresh is milky, but later turns viscid and assumes a brownish-red colour. It retains its odour for a long time and has a bitter aromatic taste. It is soluble in alcohol to the extent of about 10 per cent., in water to about 50 per cent. and also in ether and alkalis. It stains paper yellow and gives a urinous smell on heating. It contains ammonia, olein, cholesterin, fat, wax, gelatinous matter, albuminous substances and leaves an ash, which contains chiefly the chlorides of sodium, potassium and calcium. Musk yields by distillation with steam and subsequent purification a small percentage of a viscid, colourless oil with a very powerful and agreeable odour of musk; this oil appears to be a ketone and has been termed 'muskone'. Musk is remarkable for the power, permanency, and stability of its odour, everything in its vicinity becoming affected by it and retaining the scent for a long time. It has been highly valued in perfumery and, though now not used alone, is

very largely employed to give permanence and strength to other odours. Perfumers use the scent for imparting an odour to soaps, powders, and in mixing liquid perfumery. Its fragrance is completely destroyed by contact with bodies such as camphor, valerian, bitter almonds, garlic, hydrocyanic acid and powdered ergot.

Pharmacological action.—Little is known regarding the pharmacological action of this popular remedy. Most of the experiments recorded have been conducted with samples of musk obtained from the market which are likely to be, and as a matter of fact always are, highly adulterated. The tinctures of musk, both imported and indigenous, are not above suspicion. With a view to obviating any possible error in our observations, we obtained genuine samples of musk from a well-known practitioner of the indigenous system of medicine. These samples were collected from original musk pods from musk deer killed in the territories of the Rana Saheb of Tharoch (Simla Hills States), and also some were obtained from reliable dealers in Kashmir.

Solutions for pharmacological experiments were prepared in our laboratory by macerating the musk in a small quantity of alcohol and dissolving the whole in water, and keeping it for 24 hours. If the sample is moist, it can be dried in a vacuum desiccator over sulphuric acid when it loses nearly 15 to 20 per cent. of its weight of water. Musk is fairly soluble in water and by the above method of treatment 70 to 75 per cent. of the material goes into solution, leaving behind debris of vegetable and cellular matter. If the solution is heated, a little more musk goes into solution but this was avoided as this is likely to lead to escape of the volatile matter contained in the musk.

Action on the higher centres.—Musk has been used for a long time in the indigenous medicine in India as a nerve sedative in epilepsy, hysteria and convulsions in children. Indeed, in nearly all pharmacopœias, ancient or modern, there are included a group of drugs which are characterized by a very powerful odour and which have been employed as nerve sedatives. It is very difficult, however, definitely to substantiate, by experimental proof in the laboratory, the beneficial action of such drugs. Macht and Tung (1921) devised a technique for studying quantitatively the sedative effects of musk and other odorous substances on the central nervous system. A few drops of the solution of the aromatic drug were added to a wad of cotton in the neck of a funnel, under which rats were confined for about 15 minutes. The rats were then placed in the entrance to a maze and the time of traversing and the number of errors during their passage were noted. It was found that musk produced only a very slight depression of the higher centres, if any at all. In our experiments on animals in the laboratory, there was no evidence to show that musk

has a sedative action at all. In doses of 2 grains administered orally in several cases in the hospital, no sedative effect of the drug could be observed.

Action on the circulatory system.—Intravenous injections of 10 to 20 mgm. of the soluble portion of musk in 1 to 2 c.cm. of water, injected into the femoral vein of cats under chloralose anaesthesia, do not show any change in the carotid blood pressure. In higher doses also, very little effect is observed. In isolated hearts of rabbits and kittens perfused by the Langendorff method watery solutions of musk in concentrations varying from 1 in 1,000 to 1 in 200,000 do not bring about any alteration in the rate, rhythm and force of contraction of the heart. On the amphibian heart, injections of aqueous solution of musk in the lymph sac or under the skin of frogs do not produce any noticeable change. In the isolated heart of frogs also, perfused with Ringer's solution (0.6 per cent.), no stimulation of the organ is discernible on addition of weak or concentrated solutions of musk. Mudaliar, David and Reddy (1929) have also recorded similar observations with tincture of musk obtained from Messrs. Southal Bros. and Barclay Ltd., Birmingham.

Action on the cellular elements of blood.—According to Mudaliar, David and Reddy (1929) musk has a well-marked effect on the cellular elements of the blood. The total number of leucocytes is said to be increased after oral administration. This effect according to these workers is particularly marked in patients who have leucopenia, the total leucocytic count being doubled in some patients after musk, while comparatively little change is produced in normal individuals or in those with leucocytosis. They administered 10 to 20 minims of tincture of musk in an ounce of water and found that within $\frac{1}{2}$ to 1 hour after administration the total leucocyte count showed a definite increase. In order to confirm these observations, we tried the drug on a series of six patients suffering from the leucopenia of kala-azar in the wards of the Carmichael Hospital for Tropical Diseases as well as on some normal individuals. We are very grateful to Dr. L. E. Napier for his courtesy in allowing us to give it to his patients. Powdered musk in doses of 1 grain was administered to these subjects $2\frac{1}{2}$ hours after food daily for seven consecutive days and regular records were kept of the blood pressure, and of the rate, volume and tension of the radial pulse; the total erythrocytic and leucocytic counts were done at the same time. As the counts done soon after musk is given are likely to be fallacious on account of psychical and gastric reflexes set up by the drug, we made our observations at least two to three hours after the dose was given. The blood counts were made before the administration of musk and daily counts were made after its adminis-

tration and again at the end of a period of seven days; even at this date no appreciable changes were observed in the cellular elements of the blood. The blood pressure, pulse rate, tension, etc., showed no appreciable changes. In healthy individuals (laboratory assistants) no change in the pulse rate, blood pressure or blood counts could be observed after two grain doses of musk. The subjects, however, stated that they felt a general sensation of well-being in the stomach and that the drug seemed to produce an effect resembling a dose of a carminative mixture containing essential oil which was administered to the same individuals with a view to comparing the effects. The results obtained with regard to blood counts, etc., in the kala-azar patients are given in the following table, p. 325.

Action on the respiratory system.—In animals under urethane anaesthesia, injections of 10 to 20 mgm. of soluble portions of musk in 1 to 2 c.cm. of water produce little or no change in the frequency, rhythm or intratracheal pressure. When, however, a cotton-wool pledget soaked in musk solution is brought in close proximity to the nose of such an animal, a distinct but very transient stimulation of respiration is noticed. This transient stimulation is also observed when a minute quantity of aqueous solution of musk is gently sprayed by means of a fine syringe into the nasal mucous membrane of the anaesthetized animal. The time taken for the stimulation in the latter case, however, is longer than when musk is brought in contact with the nose. This is probably due to the fact that odorous substances must be in a volatile state to produce typical odour responses through the olfactory nerve endings. Musk solutions when sprayed directly into the tracheal mucous membrane through an opening in the tracheal cannula, however, fail to produce even the transient stimulation noticed in the case of the direct application on to the nasal mucous membrane. These experiments show that musk has got no direct action on the respiratory system. Whatever slight stimulation of respiration is observed is probably entirely reflex, brought about by the stimulation of the olfactory nerves of the nasal mucous membrane which carry the impulses via the olfactory bulbs and tracts to the higher centres in the hippocampal gyrus. From these centres, the medulla is probably stimulated through the conducting fibres. This seems likely as musk is the most powerful of the odorous substances known. Valentin (1903) has estimated that a total of 0.02 mgm. (0.00,000,009 mgm. per litre) can be distinctly smelt by human beings. From this the strong sensory stimulation which is produced can be easily imagined.

Uses of musk in medicine.—Musk has been used by the Hindu physicians for a long time and forms a constituent of a number of preparations. In the *Bhavaprakasha* three varieties

TABLE

Name of patient	Blood pressure	Pulse rate	Erythrocyte count	Leucocyte count	REMARKS
R. P.	S = 90/42 mm. Hg.	80	2,790,000 per c.mm.	3,432 per c.mm.	Before musk.
	D " 96/42 " "	86	2,840,000 " "	3,276 " "	3 hours after musk. °
	" 90/40 " "	80	2,800,000 " "	4,056 " "	7 days after musk.
M. B.	" 110/62 mm. Hg.	94	2,070,000 per c.mm.	3,120 per c.mm.	Before musk.
	" 110/60 " "	100	2,780,000 " "	2,808 " "	3 hours after musk.
	" 106/64 " "	100	3,100,000 " "	2,340 " "	7 days after musk.
S. A.	" 106/44 mm. Hg.	96	2,810,000 per c.mm.	1,560 per c.mm.	Before musk.
	" 110/44 " "	94	2,520,000 " "	2,028 " "	3 hours after musk.
	" 100/50 " "	92	2,810,000 " "	2,340 " "	7 days after musk.
L. B.	" 98/62 mm. Hg.	110	2,800,000 per c.mm.	4,056 per c.mm.	Before musk.
	" 98/62 " "	120	2,070,000 " "	4,368 " "	3 hours after musk.
	" 106/64 " "	96	2,270,000 " "	5,304 " "	7 days after musk.
D.	" 90/50 mm. Hg.	110	2,640,000 per c.mm.	3,276 per c.mm.	Before musk.
	" 90/52 " "	110	2,840,000 " "	3,432 " "	3 hours after musk.
	" 72/40 " "	100	2,420,000 " "	3,744 " "	7 days after musk.
D. B.	" 100/64 mm. Hg.	92	3,260,000 per c.mm.	3,588 per c.mm.	Before musk.
	" 98/64 " "	98	3,470,000 " "	3,744 " "	3 hours after musk.
	" 102/58 " "	96	2,790,000 " "	3,744 " "	7 days after musk.

are described, namely 'Kamrupa', 'Nepala' and 'Kashmira'. The first is described as black and superior to others, and probably consists of China and Tibet musk imported *via* Kamrup. That from Nepal is described as being bluish-black in colour and is of intermediate quality, while the Kashmiri musk is inferior to all. The Hindu physicians regard the drug as a cardiac and general stimulant, and as an aphrodisiac, and employ it as an antispasmodic, as an anodyne, in low fevers, in chronic cough, in general debility and in impotence. Its fame as a cardiac stimulant is so great that it is almost the last resort when everything else has failed to support the heart. As a cardiac stimulant, it is prescribed sometimes alone and sometimes in combination with 'Makaradhwaja' (insoluble sulphide of mercury) and *Sida cordifolia* which contains ephedrine. It is said to stimulate the brain, the medullary centres especially the respiratory and vasomotor centres, the spinal cord and the peripheral nerves. It is believed to increase the arterial tension and is said to stimulate the urogenital organs. The elimination like that of the essential oils is said to be chiefly by the urine, but some is excreted by the sweat and milk. In low fevers with prostration, anæmia and general debility as a result of chronic ailments it is particularly valued. Its use as an aphrodisiac in sexual impotence has been very much in vogue. Tamil physicians in south India prescribe the remedy in convulsions of

children, in combination with opium. It is also reputed to cure dyspepsia and colitis.

Musk was introduced into western medicine probably in the latter part of the sixteenth century. Since then, it has been prescribed as a stimulant in many ailments, *e.g.*, typhoid fever, typhus, gout, lock-jaw or tetanus, hydrophobia, epileptiform and hysterical attacks, chorea, whooping cough, hiccough, asthma, colic, etc. Crookshank (1905) spoke of the drug as being useful in acute specific infections resulting in toxic involvement of the central nervous system. He gave 5 grains of the powdered musk every 2 hours with satisfactory results. In convulsions of children where no definite causative factor can be determined, musk has been used with promising results in combination with chloral hydrate. Still (1906) recommended in such patients a rectal injection of chloral hydrate (gr. 5 to gr. 10 according to age) and tincture of musk (10 drops to 30 drops). It has also been used as a cardiac stimulant in failing circulation and palpitation of the heart under the belief that it raises the blood pressure and improves the character and volume of the pulse. Dr. A. Mitra of Kashmir (1898) found musk of great value in cardiac asthenia due to plague. The belief in the efficacy of the drug is, however, gradually changing. Musk was once official in the British Pharmacopœia but has since been removed. It was official in U. S. P. IX but has been deleted from U. S. P. X.

Tincture of musk is still very largely used by medical men in India in doses of 10 to 30 minims as a cardiac stimulant, in depressed conditions of the nervous system and as an aphrodisiac. Our own work, both experimental and clinical, does not bear out the cardiac-tonic and leucocyte-raising properties attributed to musk. Whatever stimulant effect it has is probably reflex from the olfactory nerves on account of its strong smell, and from the stomach on account of its slightly irritant effect on the mucous membrane. We have already observed that patients who had received a dose of musk have a feeling of warmth and well-being in the stomach and this may reflexly produce slight stimulation of the heart and respiration. There appears to be no foundation for belief in its efficacy as an aphrodisiac, in the treatment of epilepsy, of chorea and in convulsions of children. In hysteriform attacks it probably acts in very much the same way as strong-smelling substances such as asafoetida, valerian, etc. In whooping cough and colic its action probably resembles that of the essential oils group. From our observations we have come to the conclusion that the importance of musk as a cardiac and respiratory stimulant in the indigenous medicine in India has been very much overrated and that it has not any very marked physiological or therapeutic properties.

We are grateful to Dr. S. Ganguly, M.B., for his help in connection with this work.

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OBSERVATIONS ON THE COMPOSITION OF BUTTER IMPORTED INTO BURMA

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TWENTY-two samples were examined representing the countries importing them. The origin in some cases was India, and no doubt the other brands are found on the Indian market. The observations and conclusions drawn from them are therefore of interest to India as well as Burma.

Descriptive details and the composition of the samples are shown in table I.

The water content was somewhat excessive in a few cases. Seven samples (3 Australian

and 4 Indian) gave over 16 per cent., the generally-accepted standard, but in five of these cases the percentage was below 17, the other two being 17.04 and 17.50 per cent. respectively.

Several of the samples contained boric acid, although the quantity was not usually excessive. Where no preservative was shown to be present this result was quite independent of the origin of the sample, and it is important to note that one of these samples was described as being 'packed expressly for tropical climates'.

There appears to be no argument therefore for the use of preservatives. It is merely a matter of observing cleanliness in preparation.

The fat was thoroughly examined and table II summarizes the results obtained for the various analytical constants. They were generally satisfactory.

It is well known that butter-fat consists mainly of the triglycerides of the higher fatty acids, including variable amounts of butyric, caproic, caprylic, capric, lauric, myristic, stearic, palmitic, and oleic acids. Advantage is taken of the comparative volatility of the first five of these acids in the estimation of butter and its adulterants. Butyric acid is the most characteristic constituent of butter-fat and its relationship with the other acids possessing like properties is of paramount importance.

From the distribution of the Polenske and Kirschner values, and their relationship to the Reichert-Meissl value shown above, it would appear that the butyric acid content is relatively higher in Indian butters, with a corresponding lowering of the insoluble volatile fatty acids (caprylic, capric, and lauric acids).

This point might be usefully noted when the examination of butter is under consideration.

A CONTRIBUTION TO THE SURGERY OF FASCIAL TRANSPLANTATION

(WITH ILLUSTRATIVE CASES)

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Of late years grafts of fascia lata have been frequently used for reparative surgery. In the army these reparative operations are specially useful as one has to deal with cases of injury and their after-effects. The practical application of fascial transplantation is the outcome of experimental works by various observers. It can be used for diverse purposes, e.g., treatment of hernia, adherent scars, repair of tendons, arthroplasty, etc.

In this paper the more popular uses of the graft, technique of the operations, and their results will be briefly discussed.

Anatomical considerations

The deep fascia of the thigh forms a tubular sheath for the muscles of the thigh, deep to

inserted to prevent re-adhesion. In cases where the tendon is severed and the patient reports for treatment a few months after the initial injury, it is practically impossible to appose the cut ends. Repair of the tendon is always more satisfactory than tendon transplantation, as in the latter either some muscle is thrown out of action or the same muscle has to act on two different tendons. Moreover the fascial graft can always be obtained in sufficient quantity and its removal has no ill effects. The strip of fascia removed is cut to correspond to the size and shape of the tendon to be repaired. Transplantation should be done when the wound is thoroughly healed and there is no chance of reeruption of the sepsis.

TECHNIQUE

Repair of tendon

The divided ends are freed from adhesions. A catgut ligature is tied $\frac{1}{4}$ inch from each cut extremity and a second encircling ligature is similarly tied $\frac{1}{4}$ inch away from the first. If the tendon is long other constricting ligatures $\frac{1}{2}$ inch apart should be applied.

The piece of fascia lata is then removed, the width of the graft being three times that of the tendon, and its length at least 2 inches in excess of the gap to be filled up. The graft is cut to the required shape and placed behind the tendon. The cut ends of the tendon are approximated by flexing or extending the nearest joint. The ends of the graft are anchored to the tendon by two sutures passing through the graft and the tendon between the two constricting ligatures at each end. The graft is then fixed by additional sutures to the tendon beyond the last constricting ligature. One margin of the graft is now folded over the tendon and its free edge is stitched to the other side of the graft just beyond the tendon with a continuous catgut suture, so that it forms a tube at the extremities of which the cut ends of the tendon have been fixed. A retaining stitch including the graft and the tendon at either end will prevent it from slipping. The other margin is then folded over the tendon and its free edge is similarly stitched to the graft but the stitches pass through the tendon as well. So that at the completion of the operation the graft forms a complete tube with its anterior part consisting of two layers and the cut ends of the tendons are fixed into it.

MAKING A NEW TENDON SHEATH

Technique.—The graft is taken from the anterior part of the thigh. It should be $1\frac{1}{2}$ inches longer than the graft used for repair of the tendon. It is placed deep to the tendon and fixed to the deeper structures by a number of interrupted stitches so that the tendon may glide on it freely. One margin of it is then folded over the tendon and is stitched to the graft on the other side and is united with a continuous catgut suture so as to form a tube ensheathing the tendon. The other margin is then similarly turned over to the other side and united with a continuous catgut suture. The stitches must not include the tendon and the latter must be left free to glide inside the newly-formed sheath.

Case 5.—Sepoy, 3/10th Baluch. Regiment. Old wound on the dorsum of the left wrist, dividing the tendon of the extensor pollicis longus. The gap between the cut ends was about 2 inches and there was a mass of cicatricial tissue. The redundant scar tissue was removed. The tendon was repaired and a sheath was provided in the way described above. He was discharged from the hospital as fit for all duties.

Fascial grafts for tender or deformed scar.
Fascial transplantation after excision of cicatricial tissue or scar prevents the adhesion

of the skin to the deeper parts and produces the minimum amount of cicatricial tissue after operation and any tenderness or pain which had been present before disappears. It gives extraordinarily good results.

Case 6.—Havildar, 4/12th F. F. Regiment. Shot in the back between the right scapula and vertebral column. The bullet was removed but the big lacerated wound took five weeks to heal. The patient could not move his arm as it caused pain and interfered with the free movement of the scapula. Massage, movement, electrical treatment for two months and injections of fibrolysin did not produce any improvement. The scar was excised, cicatricial tissue removed and a graft was placed between the subcutaneous tissue and the deeper structures. The patient made an uninterrupted recovery and was fit for duty in six weeks time.

Case 7.—Sepoy, 3/12th F. F. Regiment. He was shot through the right buttock and there was a big scar adherent to the muscles beneath. Treated in the same way and cured.

Arthroplasty

A false joint can be constructed or the union between two bony surfaces may be prevented by interposing a piece of the fascia between the bones. The fascia lata can be removed in sufficient quantity so as to provide a covering for the largest joint in the body. The joint surfaces must be thoroughly and amply covered with the fascia and it must be firmly fixed in position. This can be achieved by fixing the edges of the graft directly into the bone. The bones forming the joint are freely exposed, and the contiguous margins are made as smooth as possible. The fascia from the upper and lateral part is the best to use for this purpose.

I have done the operation mostly for the smaller joints of the hand and finger with good results. There was one case of a driver of the Mechanical Transport with ankylosis of the proximal left radio-ulnar joint who was cured by fascial transplantation. I tried it in a case of ankylosis of the elbow joint but the result was disappointing. I can hardly believe that transplantation in the case of the bigger joints could make a man efficient enough to be fit for military duties as a soldier.

Hernia of muscle

In traumatic hernia of muscle, the sheath is often too thin and the gap too large to effect efficient closure. The cases I saw were the results of gunshot injuries during the Great War.

Case 8.—Sepoy, 3/12th F. F. Regiment. Hernia of the calf muscle about the size of a hen's egg. He was twice operated upon for this but it recurred each time. The hernia was exposed by a semilunar incision. A piece of the fascial graft was transplanted to close the gap in the sheath of the muscle, stitching it in position with continuous catgut suture, the size of the graft being $\frac{3}{4}$ inch larger than the hernial aperture, on all sides. The skin was closed in the ordinary way. There was no recurrence so long as the patient was in the same station (over one year).

Making a new nerve sheath

Fascial transplantation has been used to provide sheaths for nerves after neurolysis.

The sheath is kept a little loose as it undergoes secondary contraction and may thereby constrict the nerve.

Technique.—The nerve is exposed and cleaned of all scar tissue. The required amount of fascia is removed from the anterior aspect of the thigh and placed beneath the nerve. The graft is anchored in position by two catgut stitches which are passed through the graft and the nerve sheath or the remnants of it, taking care not to include the nerve tissue in the suture. The edges of the graft are then stitched with continuous catgut sutures as in the case of making a new tendon sheath.

Other uses of fascial grafts.—They have been used for repair of the arterial wall and defects in the dura mater, urethra, and hollow viscera with very good results.

A Mirror of Hospital Practice

A CASE OF BLACKWATER FEVER TREATED BY ATEBRIN

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THAT 'Atebrin'—the newly-introduced synthetic preparation for the treatment of malaria—may be of value in cases of blackwater fever, where the patients are intolerant to quinine, appears to be indicated by the following case history.

A. K. C., Hindu male, aged 13, was admitted to the Carmichael Hospital for Tropical Diseases, Calcutta, on the 21st January, 1932, for the treatment of blackwater fever.

He stated that he had been getting fever off and on for the previous six months. About two weeks before admission he had hæmoglobinuria during a febrile attack, after eight doses of quinine mixture had been given (the exact quantity of quinine not being known).

21st January, 1932.—On admission, the temperature was 98°F., pulse 106. The spleen was enlarged to 2½ finger-breadths below the costal margin, and the liver was just palpable. There was a slight icteric tinge of the conjunctivæ.

Very scanty rings of *P. falciparum* were present in the blood films.

An alkaline mixture was prescribed.

22nd January, 1932.—The morning urine showed abundant urobilin, but no hæmoglobin.

Two doses of quinine mixture (each containing 5 grains) were administered, and the patient at once commenced to pass hæmoglobinuric urine.

Thin and thick blood films were taken 5½ hours after the onset of hæmoglobinuria; no parasites were seen.

An hour after the onset of hæmoglobinuria 12 cubic centimetres of blood were taken from the patient's vein. Of this, 10 cubic centimetres were injected intramuscularly into a small *Macacus rhesus* monkey weighing 1,788 grammes. This monkey was kept under observation, and its blood examined from time to time until March 18th. It remained in good health and at no time showed any malarial parasites in its blood.

Two cubic centimetres of the blood were inoculated into Fletcher's medium for leptospiræ. This culture remained sterile and showed no leptospiræ for 22 days.

23rd January, 1932.—Hæmoglobinuria continued.

Thin and thick blood films were examined; no parasites were seen.

The red corpuscle count was 2,180,000 per cubic millimetre. Hookworm ova and a trichomonas were found in the stool. The urine was loaded with hæmoglobin and urobilin, but showed no bile pigment.

The patient was now put on to alkaline mixture, with calcium lactate and parathyroid extract. No quinine was given.

24th January, 1932.—Temperature continued. Temperature rose to 104°F. during the night.

25th January, 1932.—Hæmoglobinuria still continued, but was less. Temperature rose to 102.4°F. Patient extremely anæmic, and with severe jaundice. Condition critical. Given glucose *per rectum* and adrenalin injections.

Thin and thick blood films were taken; no parasites were seen.

The red corpuscle count was 1,640,000 per cubic millimetre.

26th January, 1932.—Hæmoglobinuria had ceased.

28th January, 1932.—Patient better. Urine loaded with urobilin, but showed no hæmoglobin and no bile pigment.

31st January, 1932.—Patient convalescent; treatment discontinued. Thin and thick blood films; no parasites seen. Halometer reading 4.8, i.e., average diameter of red corpuscles 7.17 μ (or normal).

31st January, 1932, to 15th February, 1932.—Patient convalescent; temperature normal. No parasites had been seen in the thin or thick blood films since 21st January, 1932.

16th February, 1932.—Temperature 99°F.; thin and thick blood films examined; no parasites were seen.

17th February, 1932.—Rings of *P. falciparum* in blood films (clearly a relapse).

Marked jaundice, but no hæmoglobinuria.

18th February, 1932.—Temperature 101.8°F. Numerous rings and a few growing trophozoites of *P. falciparum* in blood films.

19th February, 1932.—Temperature 101.6°F. Parasite count 10,240 per cubic millimetre—rings.

20th February, 1932.—Temperature 100°F. Parasite count 16,880 per cubic millimetre—rings. Atebrin was prescribed; one tablet (0.1 gramme) twice daily for five days. Urine showed abundant urobilin, but no hæmoglobin.

21st February, 1932.—Temperature normal. Scanty rings in films.

22nd February, 1932.—Temperature subnormal. Very scanty rings in films—less than 40 per cubic millimetre. Pigment-containing large mononuclears in films.

23rd to 25th February, 1932.—Temperature normal. No parasites seen.

28th February, 1932.—A Bass culture of 5 cubic centimetres of blood for malaria remained sterile.

10th March, 1932, to 13th March, 1932.—Half an ounce of stock quinine mixture (10 grains to the ounce) was given twice daily; no hæmoglobinuria resulted.

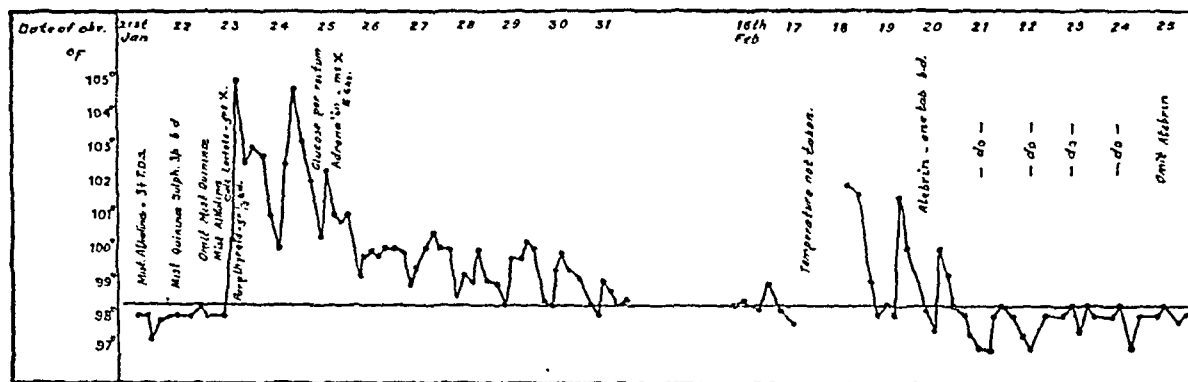
14th March, 1932.—Patient discharged in good health. The temperature chart is here reproduced.

Discussion.—The history clearly indicates that the case was one of susceptibility to quinine. His attack of blackwater fever prior to admission to hospital was precipitated by quinine administration. So also was his second attack immediately after admission to hospital. There seems little reason to doubt that, had quinine been administered during his third attack of fever, hæmoglobinuria would have resulted.

On the other hand, under Atebrin treatment both fever and parasites rapidly disappeared; there was no hæmoglobinuria, and the drug was

Name—A. K. C.

Age—13 years.



extremely well tolerated. The final blood culture test appeared to show that the malaria infection had been eradicated, whilst the patient was finally able to take quinine in full doses with no return of hæmoglobinuria.

In Atebrin we appear to have a drug especially suitable for the treatment of malaria in subjects susceptible to quinine, and its use in blackwater fever should certainly be tried further.

My thanks are due to Dr. S. P. Bhattacharji, Officiating Professor of Tropical Medicine at the School, for letting me try Atebrin in the case of this patient, who was under his care, and to Dr. O. Urchs, the medical representative in India, of Bayer-Meister Lucius of Leverkusen for a free supply.

A CASE OF CEREBROSPINAL MENINGITIS

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A PATIENT, aged 12, was admitted on 30th December, 1930, with a temperature of 105°F., pulse 150 per minute, thin and irregular, eyes blood-shot, pupils equal, reacting to light, tongue coated in the middle and red at the tip, mental condition confused, semi-conscious with raving delirium, very restless, having frequent rigors, reflexes normal, and tenderness with rigidity over the abdomen.

His history was that of sudden onset with severe headache and slight fever with rigor; the following day the patient was given indigenous medicine. He had one motion and vomited once after which the headache was better. The same night again he had high fever with continuous shivering and headache, and he became unconscious. He was brought to the hospital the next morning.

The patient had been in the hospital four years before for an attack of acute tonsillitis,

cold and cervical adenitis; he improved after treatment.

On admission, malarial parasites were found in his peripheral blood and his leucocyte count was 15,300 per c.mm. Intravenous quinine was given and the patient showed signs of improvement the next day. He was less delirious, he could swallow, his mental condition was clearer, and his temperature was down to 103°F.; but this improvement did not continue. From the 5th day typhoid was suspected, as the patient had severe abdominal pain with tenderness, rigidity, and continued fever. The Widal test was done; it was negative.

The ninth day after admission meningitis was diagnosed by clinical as well as laboratory findings. The patient had a rigid and painful neck with attacks of earache and cramps in his neck. His reflexes were exaggerated; his knee jerks were ++, Babinski's sign present, and Kernig's sign ++. He was conscious, but drowsy with muttering delirium. Lumbar puncture was done; the fluid was under pressure, very cloudy with flakes, leucocyte count 2,500 per c.mm., polymorphonuclears predominating; a smear showed intracellular Gram-negative diplococci but no tubercle bacilli; the globulin was increased, sugar absent.

The patient was given antimeningococcus serum, 5 c.cm. per dose—intrathecal for 4 doses on successive days. After the first dose the patient improved, the temperature came down steadily, and the general condition improved up to a point. During the third week the patient remained much the same, but the nervous signs continued during this week, and by the 4th week the patient began to go downhill; he was apathetic, with muttering delirium; there were trophic sores over pressure parts; the left eye was bulging out with an ecchymosis around it. By the 5th week he was exhausted; his breathing was shallow, and his pulse rapid, weak and irregular; he died at the end of this week.

Autopsy findings

General appearance—emaciated, left eye—bulging, cornea—ulcerated, abdomen—scaphoid, bed sores over pressure parts.

Head.—The meninges showed intense congestion; they were thickened and adherent to the bone and grey matter in places; the vessels over the brain were congested; flakes of fibrin were present between the brain and membranes. A fairly big abscess was present in the cisterna cerebello-medullaris from which pus welled out on pressure. The brain substance was soft over the same region, also over the left lateral ventricle. On pressure over the abscess, pus came out into the lateral ventricle.

An outstanding feature of the autopsy was the intense congestion of all the viscera; the spleen was very soft.

My thanks are due to Dr. Anna Degenring, M.D., for her permission to publish this.

SPONTANEOUS SEPARATION OF AN INTUSSUSCEPTUM WITH RECOVERY

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S. S., Hindu male, aged 50 years, was admitted to Haddo Hospital on 7th September, 1931, with the history that he had been passing for the last five days frequent scanty stools containing mucus and blood, with tenesmus and tormina. At this time of the year, a number of cases of dysentery, both acute and chronic, were being treated at the Haddo Hospital.

Previous history.—Original weight—117 pounds. Amœbic dysentery in 1922, since then he has kept fit and has had no admissions to hospital.

Condition at the time of admission.—Temperature 99°F., pulse 100 per minute, respiration 34 per minute, abdomen distended, slight rigidity on the right side about the lumbar and the iliac region, agonizing pain occurring in spasms, and slight tenderness over this area, but nothing suggestive of general peritonitis. No tumour was palpable. The case was regarded as one of acute bacillary dysentery at the time of admission, but one noticeable feature was that he did not have, as is usual in dysentery, any tenderness or pain in the region of the pelvic colon. It was thought that the ascending colon was the seat of invasion. Repeated stool examination showed nothing typical, the typical cellular exudate of bacillary dysentery was absent and on the contrary Charcot-Leyden crystals were found in the stools. With this indication emetine was instituted as the line of treatment, with a saline purge every morning and bismuth carbonate in one drachm doses three times a day, turpentine

stupes, and high rectal enemas, for the first four days. The frequency of the stools from about 30 in 24 hours was gradually reduced to 10 to 15, but there was not the slightest change in abdominal distension and the pain was as agonizing as ever, colicky and spasmodic in character.

By the 10th September an ill-defined swelling could be palpated in the right iliac and lumbar region, the feel of which was soft and doughy, the consistency varying from time to time during palpation. The case was now looked upon as one of intussusception, but obstruction was not complete, as he was able to pass faecal matter and flatus freely with great relief to his pain and discomfort. On the 11th September, the patient stated that through his anal orifice a mass of 'flesh' had protruded; this subsequently disappeared.

The protruding mass was seen by me the same evening; I thought it was a prolapsed rectum and replaced it. The patient complained that the replacing of this mass caused him much pain and discomfort, and that it was better for it to be out than in. On the following day I was called early in the morning to replace the protruded mass, when to my surprise the patient was seen holding what appeared to be a piece of gut 12 inches in length. This was protruding from the anal orifice, loosely attached like a slough and was therefore scissored away. The piece on removal was a patent canal 12 inches long; there was no doubt that this was a portion of the small intestine and it looked like the lower end of the ileum. The patient felt great relief when this mass was removed, but the lump in the right lumbar region was still present; the distension of the abdomen however gradually disappeared in the course of two days, also the agonizing pain, the tenderness on palpation and the rigidity. The dysenteric symptoms passed off and the patient made an uneventful recovery.

The case was apparently one in which the invaginated portion of the ileum became spontaneously detached by a process of strangulation and sloughing, general peritonitis having been prevented by a condition of protective adhesive peritonitis.

My excuse for publishing these case notes is the extreme rarity of such a condition.

Present condition of the patient.—Weight 110 pounds. He is free from all symptoms, and there is no sign of stenosis, the bowels are regular. The patient is periodically examined and is kept under observation in the convalescent gang.

In conclusion I must thank the Senior Medical Officer, Major A. J. D'Souza, M.C., I.M.S., for his guidance in writing these notes, as well as for his permission to publish them.

Indian Medical Gazette

JUNE

THE ÆTIOLOGY OF CARCINOMA

A LECTURE which gives a very clear presentation of our present knowledge with regard to the ætiology of cancer is one by Mr. J. J. M. Shaw, M.C., M.D., F.R.C.S., F.R.S. (Ed.), Lecturer in Surgery in the University of Edinburgh, recently published in the *Lancet**. The subject is at present in such a confused state, —despite the enormous amount of research work upon it—that it comes as a relief to read an article which is characterized by a clear-cut and common-sense presentation of the facts. We may here attempt a brief review of Mr. Shaw's address.

It is perhaps not sufficiently realised that death is not an inherent property of living matter. In the Metazoa tissues are composed of cells, and potentially at least the cell is immortal. Thus tissue cultures taken from fowls have long survived the death of the birds from which they were taken. The undifferentiated cells of the embryo may be regarded as individuals, each capable theoretically of indefinite growth and multiplication. Later, these cells become specialized and grouped into tissues and organs. When this happens the imprint—so to speak—of the tissue or organ is implanted upon the cell; it has to obey the laws of function of the tissue or organ concerned. The result is that the body of the metazoan animal becomes differentiated into tissues and organs. These wear out and ultimately cannot be replaced; hence death results. In fact death is the penalty which the metazoan animal pays for its specialization of structure.

The cells of a carcinoma are either embryonic cells which have never acquired such differentiation and specialization of function, or which have acquired and then lost it. The cancer cells lead an independent life inside the body just as much as does the fetus *in utero*, perfectly adapted to the soil in which they grow. The result of such a parasitic growth may be to induce serological changes in the host, and of recent years much attention has been paid to the serology of cancer,—especially from the point of view of diagnosis. Yet the changes in the blood may well be the result of the presence of the independent growth, and not factors in its causation. 'A study of the blood and excretory changes in pregnancy yields valuable information and provides useful tests, but deductions in regard to foetal origin have not been made from them'.

* The *Lancet*, 30th Jan., 1932, p. 221, and 6th Feb., 1932, p. 273.

Carcinomata may be classified from the point of view of ætiology into three different groups, viz.:—

(i) *Implantation carcinoma*, in which a growing carcinoma is transferred from one host to another, and continues to grow in the second host without apparent modification.

(ii) *Continuing carcinomata*, in which an embryonic cell group fails to come under the influence of the mechanism of differentiation and continues to grow in its natural primitive state and to reproduce in the manner of undifferentiated multicellular organisms. In this group, the outstanding example is the renal blastoma or embryoma, which often cannot be accurately classified as carcinoma or sarcoma because the stage of differentiation into germinal layers has not been attained.

(iii) *Conversion carcinomata*, in which a single undifferentiated cell or cell group becomes altered under some change in environment so that its previous differentiation and specialization disappear or become modified. In contrast to the processes of repair, this de-differentiation remains established.

Implantation carcinomata have been very intensively studied in the laboratory. A true implantation consists of the transfer of living carcinomatous cells into a host in which they continue to thrive in situations where epithelial tissue is not normally found. And here certain facts emerge. The first is that the species limitation is extremely strict and in only one instance has a successful transplant been made from one species to another, when a mouse carcinoma was transferred to the brain of a rat. A few of these experimental tumours have become celebrated and are passed from one laboratory to another owing to their ready growth on implantation. Where the graft fails to take this is due to its being strangled by fibrous tissue; where the graft takes the surrounding connective tissue becomes its source of blood supply and nourishment.

Implantation carcinomata usually occur in man as the result of operative surgery, and especially so in operations on carcinoma of the breast. Normally there is considerable resistance against epithelial invasion; thus if a small portion of a truly cut Thiersch graft be submerged into a connective tissue bed, it is invariably destroyed by fibrosis. It is only when a portion of whole skin, with its defensive barrier of corium, or an intact sebaceous or sudoriferous gland is disjoined and submerged that an implantation cyst is formed.

Implantation transfer of carcinoma from one person to another is naturally a very rare event, but two instances are quoted. The first was that of a French student who was aspirating exudate from a case of breast carcinoma after operation. The syringe which he was using broke and his palm was accidentally inoculated

with tumour cells. A malignant tumour developed at the exact site of injury and a glandular metastasis made amputation of the arm necessary. A second instance has recently been recorded by Parkes Webber. A woman was operated on for melanotic carcinoma of the thigh, and 18 months later gave birth to a child. The mother died three months after delivery, and the child at the age of 10½ months. The liver of the latter was carcinomatous.

All the recorded intentional attempts to transplant human tumour tissue have been unsuccessful. Kurzahn of Königsberg in 1926 transplanted cancerous tissue from a breast into his own forearm. Examinations made at periods of six days, two weeks and six weeks showed only signs of absorption. Even the few very successful laboratory strains of implantation cancer have only been evolved as the result of many years of work and careful selection.

Turning to the continuing carcinomata, here embryonic tumours of the kidney are chiefly concerned. These are cell rests which have not become differentiated and have retained their embryonic characters. The failure of differentiation in these tumours is attributable, not to a fault in the cells, but to a lack of the appropriate physiological stimulus to differentiation, such as an aberration in development of the capillaries. MacCarty describes three stages in tissue differentiation in the human body; first the general alignment of the cells into the normal arrangement of the adult tissue; secondly, the establishment of cellular polarity; third, the establishment of the adult morphology of the cells. In the first and second stages the cells bear almost no resemblance to the adult form. Little is known of the active agents in the process of differentiation,—whether they be nervous, vascular or chemical, or all three. Functional demands may determine the structure and morphology of a tissue or organ.

The group of conversion carcinomata is much the largest and most important. 'Our hopes lie in a fuller understanding of the conversion group, and our reasonable expectation is that, with increasing knowledge, measures of prevention may reduce their incidence, as it has already done in some of the occupational examples of this type'.

In this group the differentiated cell, or the germinal layer which is the less differentiated immediate antecedent of the fully adult type, is influenced by some change in environment to forsake its previous habit and morphology and to transmit the new characters through successive generations. In other words, the cell becomes a pervert preying upon its host in place of contributing to his functions and activities. And in this process of perversion of the cell probably both local and general factors are concerned.

The general factors have been very much studied. Heredity, in its racial and familial aspects, has an influence. The same change in local environment may ultimately produce in one individual a carcinoma, whereas in others the result will not proceed beyond a local hyperplasia or papillomatosis. In experimental production of tar cancer in mice, using a known tar and mice whose family history is known, the percentage of successful results can be predicted beforehand with some certainty. A curious fact in all such experimental work is that with the establishment of the carcinoma, the host's immunity may rise and pre-existing carcinomata or epithelial modifications progressing towards malignancy may disappear.

The 'chronic irritation' hypothesis as to the origin of cancer has the distinction of being the oldest view on the subject. Unfortunately, the term 'chronic irritation' is a little vague. Kreyberg of Oslo has studied the prolonged action of weak irritants on the skin circulation. Using tars, 5 per cent. mustard oil and the prolonged application of heat, he has shown that there is a limit to the capacity of the minute blood-vessels to return to normal after the unduly long stimulus of an irritant. After a period averaging about five weeks in mice experiments, an 'ectasia' of the vessels is produced by the throwing out of gear of the local vaso-motor reflex. This dilatation remains permanent and is followed by a capillary thrombosis and an associated connective tissue fibrosis. Respiration of the cells is interfered with by this deprivation of the capillary oxygen. The process, however, is an extremely slow one and the successive generations of affected cells have time to develop that reserve method of obtaining energy which characterizes all malignant tumours, namely glycolysis, in which the carbohydrates are split with the production of lactic acid. 'Interference with the respiration in growing cells is, from the standpoint of the physiology of metabolism, the cause of tumours. If the respiration of a growing cell is disturbed, as a rule the cell dies. If it does not die, a tumour results'.

There is probably no one single ætiological agent in the causation of cancer. The carcinogenic irritants are undoubtedly numerous, but the end results of their prolonged action on the cell are the same—the cell becomes malignant. If we turn to the question 'by what means is the necessary chronicity or constancy of application imparted to the irritants so that their service to the cells is continuous and prolonged', Mr. Shaw's reply is to suggest that the responsible factor is the nature of the medium in which the irritant substances are suspended or dissolved. This medium must be insoluble in the tissue fluids, must be viscous in consistency, and must evaporate with extreme slowness. To such

substances Mr. Shaw applies the term 'potent substances',—gasworks tar is a good example. 'Throughout the whole field of experimental carcinogenesis one is impressed by the universal use of the tars and oils as potent substances'. In the case of cancers of occupational origin, one is similarly impressed by the importance of tars and mineral oils, whereas irritants in aqueous solution do not appear capable of causing cancer.

In man the exciting irritants appear to consist of a variety of insoluble oily or greasy substances, such as stale retained secretions, purulent exudates, the mucins under certain conditions, and the insoluble elements of old extravasations of blood. In such substances the fatty acids break down and their products—especially lactic acid—act as chronic irritants. Adair and Bagg, on a detailed study of 200 cases of breast cancer, found that only 8.5 per cent. of the women so affected had a normal mammary history. They believe that the products of stagnation, decomposing and chemically altered milk, mucus, etc., stimulate an excessive growth of the epithelium lining the ducts and acini, and that, where the process has not progressed far, it corresponds with the so-called 'mastitis'. Bagg has carried out experiments in order to produce mammary stasis in mice; these animals were allowed to breed very rapidly, but the mothers were prevented from suckling their young. Marked stasis was thus produced in the ducts, and 13 out of 15 female mice so treated developed mammary cancer.

In the mouth, jagged teeth and ill-fitting dentures are causes of importance. The latter are usually found to be covered with a thin slimy pellicle, insoluble in water and difficult to remove by friction with a brush, but soluble in ether and disappearing readily in an alkaline solution. In the urinary bladder carcinoma is common among aniline dye workers, and is apparently always preceded by chronic hæmorrhagic cystitis. In the lung the association with old infected cavities is well recognised, and in cobalt workers—who are especially prone to cancer of the lung—the condition is usually preceded by a foul bronchitis.

Burns of all types may be followed by carcinoma. It is, however, the imperfectly healed burn or the one associated with a chronic fissure or ulcer, with chronic dermatitis or keratosis, which produces the condition. In such cases the stagnant secretion may operate as a mild irritant over a period of years. The partially destroyed skin gland may continue to secrete in the depth of certain keloidal burn scars, and in these a basal cell carcinoma supervenes. Lupus is an accepted precursor of cancer, but again the carcinoma supervenes in those areas where fissuring occurs—the angle of the nostril or around the mouth, or in raised yellowish patches which, on scraping, yield a greasy mass of cell debris and stale exudate. R. L. Sutton

states that in his experience a seborrhœic keratosis of long standing, often the result of actinic action, is the commonest precursor of epithelioma.

In the alimentary tract the extreme disparity in incidence of cancer between the small intestine on the one hand, and that of the stomach and colon on the other, seems explicable only on a chemico-physical basis. In the stomach and colon the action of the irritants is intensified in an acid medium, and the tenacious mucus in these sites renders their application constant. In chronic gastritis and stasis in the colon the disintegration and interaction products of the fatty acids acquire a toxic and irritant quality which is absent under the healthy conditions of rapid passage. On the other hand, in the alkaline contents of the small intestine these acids are saponified and rendered soluble.

Extravasated blood appears to be a potent substance of special importance in the ætiology of sarcoma. Also in the acceleration of growth which occurs in a carcinoma when contused or incompletely removed by surgical means.

The carcinogenetic agents which have been specially analysed have been found to possess some degree of activity as solvents of keratin. Because of their oily nature they mix with the natural oils of the epithelial surfaces and in the course of time reach the papillary lymphatics. The latter then become blocked and lymph stasis ensues, with hyperæmia and œdema. A further effect of the contact of oil with the surface of the living cell is an alteration in the interfacial surface tension of the cells with increase of their potassium content. Rapidly growing tumours have a high potassium content, whereas old, slowly growing necrobiotic tumours have a low potassium but a high calcium content.

The physico-chemical complex, which the author suggests as the means by which conversion of the cells is brought about, is slow in effecting the cycle of changes, and the result may only become manifest after cessation of the application of the potent substance. Conversion being established, the transfer of the converted cell from the epithelial zone may come about by trauma, or there may be a steady infiltration by a digestive action resembling that of the chorionic epithelium, the excess of lactic acid from glycolysis being the probable explanation of this capacity. The persistence and multiplication of the converted cell group, in which the glycolytic career is continued, inaugurates the stage of established cancer.

It will be seen that Mr. Shaw brings forward very strong arguments in favour of a physico-chemical origin of conversion cancers. The reasoning at least supplies a readily understood line of argument. He scarcely discusses the possibility of parasitic causes of cancer. It will

be remembered that Gye a few years ago suggested that cancer was due to the action of a non-specific filterable virus acting in conjunction with a specific factor of chemical nature in promoting cellular change. Of this Mr. Shaw writes, 'One can only regret that Gye's brilliant conception of the process has not been substantiated, because along that line lay the most reasonable hope of establishing a cure for the disease in full dissemination'.

WELFARE WORK AND THE POPULATION PROBLEM

On the two occasions during the last year when we have discussed the population problem, nothing has been further from our minds than the embarrassment of welfare workers in India. We had not the least intention of even criticising the present activities of either welfare workers or hygienists, and, above all, discrimination between the preventive and the medical relief services never entered our thoughts. Both prevention and cure are the immediate objective of every doctor who is true to his profession, and, though the idea of curing appeals more to the popular imagination, prevention of disease, with the attendant curtailment of suffering, must be the final ideal of all right-minded men and women, whether they be in the medical profession or not. Yet, we understand, criticism of the present public health administration and ridicule of the self-sacrificing efforts of welfare workers has been 'read into' our recent editorials; we are assured that these editorials are quoted by opponents of welfare work, and that they have been used by the indolent, the mean, and the anti-social, both men and women, who are on the look out for any excuse to shirk their obvious duty to their fellow creatures.

If this is true we can only say that we are sincerely sorry that we expressed ourselves in such a way as to give our enemies an opportunity of turning our own words against us, as we most certainly identify ourselves with the present welfare movement in India.

In using the expressions 'welfare' and 'public health' we included all private and governmental activities such as medical relief, sanitation, research, and agricultural and industrial development, which tend towards the production of health and welfare amongst the general population, and perhaps we assumed too readily that every one would regard it as axiomatic that there was a pressing need in India, as in every other country, for nation-building activities of these kinds; any country who neglects them is bound to sink into barbarism.

The final goal of public health and welfare work is the abolition of all human suffering. Such an object is visionary, it may be objected; but the statement is true, nevertheless. It is possible that we can only hope in a single life-

time to reduce this suffering by, shall we say, five per cent., but that is not our final object. Were we to achieve such a result we should not be satisfied, nor should we be satisfied if we reduced it by a half or even by 95 per cent.; we should still strive after our final objective.

Our own personal contention is that however hard we may strive, if we work *only* along our present lines, though we may achieve very considerable success, we can never hope to achieve our final object. We contend that work along the present lines, helpful though it is, is insufficient; a broader view of the problem must be taken, or much of the magnificent effort now being made will be entirely wasted. We have never suggested relaxation of this effort to save the babies, but, we say, somebody must *also* think of what is going to happen to these babies when they grow up and require feeding—in a land where there is insufficient food to maintain the present population in a proper state of nourishment. How this contention of ours can be construed as specific criticism of the excellent work of the small band of welfare workers in this country is beyond our understanding.

Again, it has been said that we are obsessed with the idea of birth control. To some minds, we are afraid, it is heresy to mention the phrase, even to countenance its existence. We are sorry if, by introducing this phrase, we have offended the religious principles of some of our friends, but we are of the opinion that the matter is too serious to allow of the consideration of personal prejudices, and we must once more point out that we did *not* advocate birth control. One of our main points was that we could not suggest a cut-and-dried remedy, and for this reason we advocated the formation of a commission. It is surely permissible to point out a danger without at the same time suggesting a ready-made scheme for avoiding it. We consider that the danger is real and that the matter is urgent; the sooner the problem is faced the easier it will be to tackle.

We realise that nothing short of the unanimous opinion of every one who has at heart the future welfare of the people of India is likely to influence public opinion, essentially the first step. We are therefore particularly anxious that that section of welfare workers, amongst whom our recent editorials have caused (we are assured) such consternation, should realize that we are entirely in sympathy with the work in which they are at present engaged, and that we differ from them only in considering that to bring about the results we all hold as our ideal it is necessary to go further and to take a wider and more rational view of the problem. We hope to be able to convince them of the reasonableness of our point of view and to persuade them to lend us their support in our demand for this examination of the problem from all aspects.

Special Article

THE BEST SOURCE OF IODINE (ORGANIC VS. INORGANIC) AS RELATED TO THYROID DISTURBANCES

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Historical study of iodine in relation to thyroid

HYPERTHYROIDISM, particularly endemic goitre, is prevalent throughout the world. It is more prevalent in some regions than in others. Since Baumann's(1) important discovery that iodine is a normal constituent of the thyroid gland, chemists have attempted to find its linkage with other molecules. Oswald(2), Hutchison(3, 4), von Cyon and Oswald(5), and many others have shown that iodine in the thyroid is bound with a protein molecule. Sufficient data are available to show that in a normal thyroid gland no inorganic iodine is present. The exact nature of the thyroid organic compounds containing iodine varies. Several workers, such as Romeis(6), Meyer(7), Kendall(8), Ingvaldsen and Cameron(9), Nürnberg(10), Weir(11), and Kendall and Simonsen(12), have shown experimentally that iodine does not occur in any one definite form. Some of them have indicated further that all of the iodine does not occur as thyroxine.

If the presence of iodine in the thyroid is a normal constituent, as has been shown by the above-mentioned workers, it may be reasonable to assume that the activity of the thyroid would depend on its relative quantity. Researches undertaken by Kendall *et al.*, as reviewed by him(13), tend to show that thyroid activity is proportional to its iodine content. Kimball *et al.* (14, 15) and Silberschmidt(16) produced some data which show the justification for the use of iodine in endemic goitre. For further details Kimball(17) may be referred to.

Iodine has not only been suggested to be beneficial in endemic goitre, but Plummer and Boothby(18), Loewy and Zondek(19), Neisser(20), Starr and Means(21), Cowell and Mellanby(22), Graham(23), Mason(24), Foster(25) and Breitner(26) have shown its value in exophthalmic goitre. Jackson(27), with reference to the primary treatment of exophthalmic goitre, writes thus: 'In my experience no single factor with the exception of iodine itself has proved of such valuable aid in the treatment of this condition'. The experience of Mosser(28) agrees with that of Jackson. It has been reported by Breitner(26) that iodine at once calms down the increased tonus of the sympathetic system, by which the hyper-sensitiveness is stopped. These claims may have been overdone somewhat, as is explained below.

All types of goitres cannot be treated successfully with iodine as shown by Kocher(29), Buford(30), Baker(31) and Evvard(32). All these authorities advocate the use of clinical methods. This they claim to be particularly true for exophthalmic goitre. There are some surgeons, however, who advocate the use of iodine along with, and without, clinical therapy, a subject outside the scope of the present thesis. It has been claimed by McCarrison*(33, 34, 35) that goitre may be produced because of some changes in the thyroid as a result of vitamine 'A' deficiency. It has been further found by Harris and Smith(36) that pathological conditions in the thyroid may be brought

about as a consequence of vitamine 'C' deficiency. From the investigations of the above-mentioned authors, as well as from the contributions of Burget(37) and Bensley(38), it seems highly probable that there exists a relationship between diet (independent of the amount of iodine) and the thyroid activity. McCarrison, however, whose work is more fully supported by data, has recently clearly stated his view when he expressed the belief that goitre is due to the relative supply of iodine. Fraser and Cameron(41) and Rabinowitch(42) recognized both iodine and vitamine as essential factors in the prevention of goitre. From these investigations a question may be raised: Is there any relationship between the amount of iodine and the synthesis of vitamine 'A' in plants in Nature? As far as the writer is concerned, there are no data available at present to answer this question. The writer, however, has undertaken this study in co-operation with the Nutrition Department (School of Home Economics), Iowa State College. It has previously been shown by Malhotra(43) that there is a relationship between some inorganic fertilizer constituents other than iodine and the synthesis of vitamine 'A' in several plants.

From the chemical, physiological, clinical and pathological literature on endemic goitre, too extensive even to abstract here, it seems reasonably well established, at least at present, that iodine is indispensable for the prevention and probably cure of endemic goitre. Its beneficial influence in this connection may be manifold. This need not be discussed here, since it is proposed to submit a fuller report comprising the clinical, biochemical, physiological and nutritional data for publication elsewhere at an early date.

Iodine also affects the body in certain other direct and indirect ways. Plummer(44) stresses its influence on the appearance and on the nervous system. Hoskins(45), Cameron and Carmichael(46, 47, 48) and Simpson(49) think that iodine may stimulate growth and development, because lack or decrease of iodine brings about a loss of thyroid function, which in early life is followed by retardation of growth. Data have been obtained by Terry(50), Birchner(51), Hoskins(52), Lim *et al.*(53), Nakao(54) and Hammett(55, 56) that the growth of bones is directly stimulated by thyroxine. Thus according to all indications, the liberal use of iodine must be of considerable importance for more than one metabolic function of the body.

The status of various types of inorganic iodine

What form of iodine is most efficient and how can it be obtained? The best method of supplying iodine deficiency has undergone a series of changes. A suggestion has been made by Little(57). Quimby(58), Longfellow(59), Sherman(60), Ellms(61) and others that iodine may be directly added to water supplies. The writer(62) has pointed out, and was later supported by others, that this is not a satisfactory means of iodine supply. He raised three serious objections, namely:—(a) Only a very small portion of the city water supply is used for drinking purposes, perhaps about 10 per cent. Thus it is conceivable that an enormous waste of iodine would make this method rather an expensive one. (b) The taste of water treated with iodine as sodium iodide or potassium iodide is very disagreeable. (c) In most of the rural districts, particularly in India, the source of water supply is direct from the well. This makes it doubly hard adequately to control its iodine content. Experience with Indian conditions shows that the simplest, most readily accessible and cheapest method alone would be satisfactory. Oleson(63) and others conclude, from the vital statistics obtained, that goitre is frequently found in sparsely populated districts (such as rural areas). Administration of iodine in the form of tablets has been preferred by some, but this also has disadvantages.

Rick(64), von Fellenberg(65), Eggenberger(66) and several others have recommended the use of iodized salt. Since such a salt is commonly used at present in most civilized countries, and since several commercial

*The writer thanks Colonel McCarrison for some suggestions and communications.

processes of manufacturing it have been developed, some points which previously have been overlooked may be worth mentioning now. It has been estimated by Miss Lewis(67) that, on the whole, less than 5 per cent. of the total salt is actually taken into the body without boiling or cooking. It has also been shown by Malhotra(68) that iodine combines easily with inorganic compounds but splits off just as readily. Such a difference between the organic and inorganic iodine can be well appreciated, based on the ionic theory. The tendency of iodine in this respect is almost the same within or without the body. Its active nature is similar to the characteristic dynamics of the other members of the halogen series.

On the other hand, iodine combines but slowly with organic molecules, at least with carbohydrates, proteins and fats. However, after such a combination it is held more firmly, as was indicated by the quantitative analysis of several specially treated economic plants for higher iodine storage before and after boiling. The same was found to be true after it had been acted on by the metabolic activities of the body. For instance it was found in many cases that iodine (as a part of carrot protein) was eliminated in the urine and faeces 10 to 15 times slower than similar iodine in combination with sea salt. Thus the experimental evidence does not support the suggestion that a proper amount of iodine can be held in the body by means of salt (or any other form of inorganic iodine) for the normal physiological functions of the thyroid gland.

Now there are a number of workers who agree with the writer in the facts mentioned above, particularly McClendon (recent years) and his co-workers at the University of Minnesota, and Remington and his associates in North Carolina. At present there seems to be but little support for administering inorganic iodine for the satisfactory and effective prevention of endemic goitre. These facts do not underestimate the value of iodized salt in the prevention of goitre. They are simply meant to show that this form of iodine is not without several drawbacks and that there is plenty of room for improvement. For instance, stable colloidal inorganic iodine, if it could be prepared, may be promising.

The sources of organic iodine and their importance

Broadly speaking, there are two sources of organic iodine* known at the present time, namely, from animal products such as milk and sea foods of different kinds; and from plant products such as vegetables, fruit and cereals. The latter have been produced and advocated by the writer during the last four years. The iodine content of both can be increased materially by artificial means. McClendon(69) has increased the iodine content of milk. However, in this state it is more in skim milk than in the fat particles, a rather undesirable feature. All the iodine is not recovered from milk, because a part is utilized by the animal body for its own thyroid activities, and a still greater portion is eliminated with the urine as a waste product. Therefore, iodine obtained from milk by feeding dairy cattle with seaweeds, such as kelps (which is practicable only near the seashore) is rather an expensive and unsatisfactory source.

Animal sea food such as lobster contains a definite range of iodine content. Even if this source of supply contains a higher percentage it is not always available without some changes (slight decomposition or putrefaction), especially in areas away from the sea coast. Assuming it could be shipped to localities away from the coast, it is very doubtful if it could be made available to the bulk of the population because of their food habits. At times financial conditions (particularly in India) would not permit its continuous use. At any rate it seems to the writer, based on his experience in

the rural areas of India and the United States of America, that this method of organic supply is not a feasible one, at least to the public at large.

Thus it would seem that the last, and probably the best source of organic iodine, for the present at least, may be vegetables, particularly root crops. The writer(62) as well as Remington, Culp and von Kolnitz(70), have shown that vegetables grown under natural environmental conditions, even in the so-called non-goitrous regions, contain insignificant amounts of iodine. It is possible, however, that the iodine content of the crops can be increased artificially. The writer(62), as well as Pfeiffer and Courth(71) (from Germany), have been able to increase the iodine content of several crops. The German workers have accomplished this end by adding iodine to the fertilizers, while the writer obtained similar results by adding iodine directly to the soil and determining its concentration in the plant and the soil. In another series he(72) controlled the hydrogen-ion concentration of the medium for the maximum permeability and diffusion of iodine into the plant root membranes, which seem semi-permeable. Recently the writer(73) has developed another method by means of which seeds may be soaked. A plant grown from the treated seed may yield a higher iodine content. The former method may be exploited for growing vegetables rich in organic iodine, while the latter may be useful in obtaining cereals of high iodine content.

Methods used in obtaining higher yields of organic iodine from plants

Two distinct methods of growing plants for high iodine content have been developed by the writer during 1926-31. The first one is applicable for vegetables and truck crops, and the second for grains. It will later be shown why it was necessary to make such a distinction between these two procedures.

Almost all truck crops can be increased with reference to their iodine content. However, it has been found experimentally that root crops, such as carrot, sugar beet, sweet potato, Irish potato, radish and so forth, can absorb and retain more iodine than vegetables other than the root crop type. This peculiar behaviour of root crops is not fully understood at present. However, microscopic studies have suggested that iodine is stored in the active parenchyma cells.

Vegetable seeds may be so sown in the soil with the addition of potassium iodide as 5,000-8,000 parts per billion. Later it was found that seeds should be sown in an ordinary soil. From the appearance of the seedlings until maturity of the plants, iodine solution (such as potassium iodide) may be added once every week. The total iodine content added each time should not exceed 300 parts per billion. This method is more satisfactory. The hydrogen-ion concentration of the soil may be adjusted so that the pH remains at a range somewhat between 5.5-6.5. Many simple methods of determining the hydrogen-ion concentration have been developed within recent years. Thus it is unnecessary to describe them here. The writer(72), Powers(74) and others have shown that this pH range is favourable for the maximum growth of most plants. The data obtained by the writer also indicate that the maximum iodine intake also takes place within the same pH range.

The results (without adjusting the hydrogen-ion concentration of the soil) are shown in Table I. A comparison of the iodine content of plants grown with and without the addition of iodine in the soil shows a higher iodine content in favour of the soil with the additional iodine. The accumulation of iodine in all kinds of crops used by the writer are illustrated in Fig. 1, which is self-explanatory. These investigations(75) show that, in the main, most of the iodine is accumulated in the parenchyma and the sclerenchyma cells. Fig. 2 shows the photomicrograph of a tomato

*The term organic iodine as used in this article refers to the atomic iodine combined with an organic molecule.

stem. The black spots in the central cells (parenchyma) and near the vascular bundles present the distribution

16,000 parts per billion, with the exception of tomato, could be noted by the writer. Even the latter plant

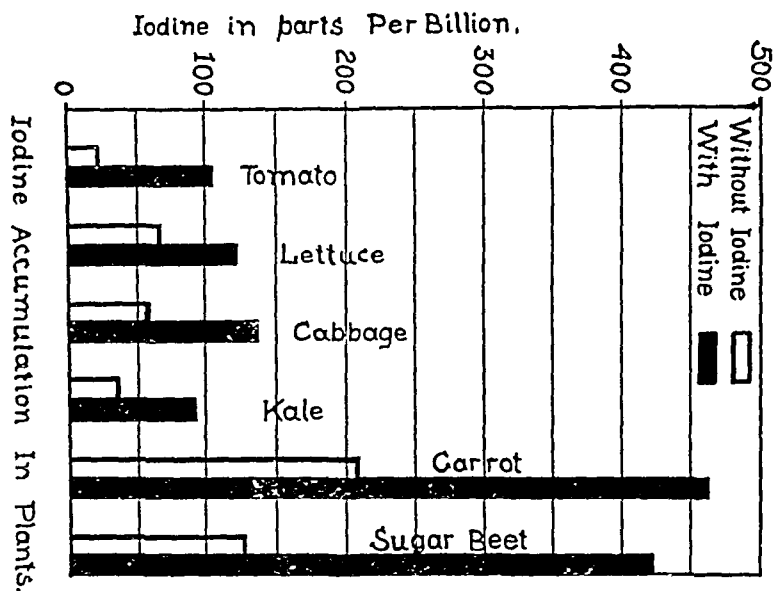


Fig. 1.—Chart showing the iodine content of different plants grown in soil with and without additional iodine. The data for 1926 only have been plotted.

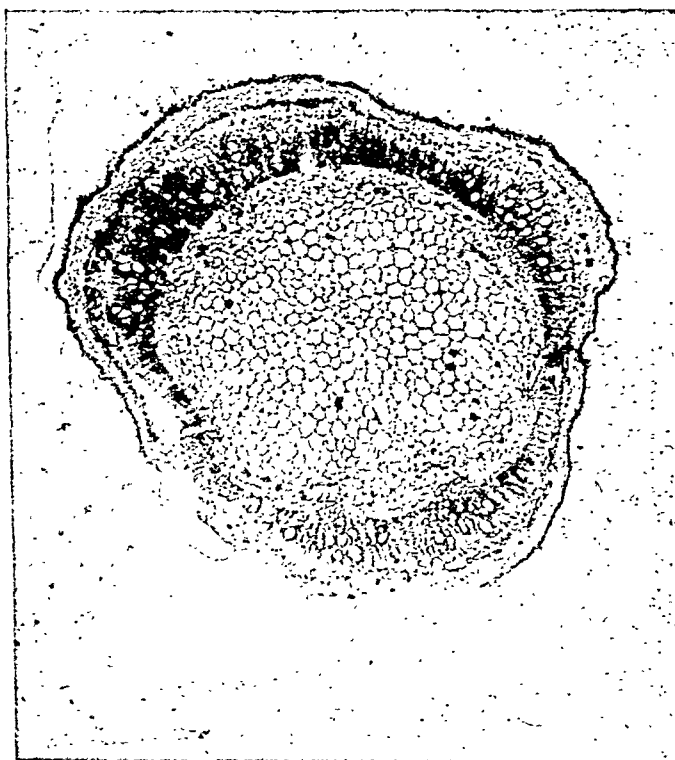


Fig. 2.—Photomicrograph of a cross section of tomato stem. Note the distribution of iodine. For details refer to the text.

of iodine as determined by the well known starch test. No depressing effect of iodine on the plants up to

did not show any iodine injury between 5,000—8,000 parts per billion of iodine in the soil.

TABLE I

Iodine content of plants grown in soil with and without the addition of iodine

Kind of plants	IODINE CONTENT OF PLANTS IN PARTS PER BILLION			
	WITHOUT ADDITIONAL IODINE 1926	WITH ADDITIONAL IODINE 1926	WITH ADDITIONAL IODINE 1929	WITHOUT ADDITIONAL IODINE 1930
	Rio Vista	Grown at: California	Chicago	St. Marys
Tomato ..	23.3	105.8	253.1	16.8
Lettuce ..	65.3	121.8	241.0	60.7
Cabbage ..	59.0	137.4	259.0	20.5
Kale ..	37.9	94.8	140.7	18.7
Carrot ..	209.3	463.3	668.8	132.6
Sugar beet	128.0	..	..	..

Note.—(1) The results recorded here are based on an average of duplicate samples of 4 plants of each kind.

(2) The soil in California was 18 miles from the Pacific Coast. Perhaps this is why it had more iodine (850 parts per billion) than at St. Marys, Kansas, about 1,000 miles from the sea coast.

(3) In the soil to which iodine was added, the reading for the total amount was always approximately 5,000 parts per billion unless otherwise stated.

(4) The 1926 experiments were conducted in soil with pH between 5.5—6.5.

The iodine content of cereals and other farm crops may be increased by soaking the respective seeds in a dilute solution of potassium iodide (0.03—0.05 per cent.) for 20—30 hours at room temperature, about 20°F. The seeds obtained at maturity of the crop may have a higher iodine content. It may be pointed out that in this case iodine most probably combines with the proteins and carbohydrates of the grains. The mechanism by means of which the growing plant can allow the entrance and accumulation of extra iodine ions from the soil is still unexplained.

Do seeds soaked in iodine solution lose or decrease their germinating capacity? Do the plants obtained from such seeds grow normally? It was found that the germinating capacity of corn, wheat, oats, peas and beans did not decrease. On the other hand, it is probable that iodine may influence their growth (some more than others) by its disinfecting properties. If this is true it may increase seed germination to some extent. In fact this seems to have been found experimentally. Table II shows the germination of corn after soaking the grains in 0.05 per cent. iodine solution and distilled water (as control) for 60 hours at different temperatures. It would seem from the data that iodine is not injurious to seeds at the lower ranges of temperature (field conditions) used in this experiment. Neither the seedlings nor the mature plants showed any signs of iodine injury or retardation, at least not apparent enough to be detected by observation.

TABLE II

Germination of the Zea Mays (corn) seeds after soaking in 0.05 per cent. of iodine solution and distilled water at various temperatures

Serial number	Temperature of the bath in C.	Original number of seeds	PERCENTAGE OF SEEDS		Characteristics of the seedling
			Germination	Non-germination.	
Iodine					
1	25	260	99	1	Best growth
2	30	260	91	9	Healthy growth
3	40	300	78	22	Ordinary growth
4	50	300	49	51	Adverse growth
5	60	280	3	97	Mould
Water					
1	25	280	89	11	Seedlings
2	30	300	89	11	Healthiest and alike.
3	40	250	87	13	Normal growth
4	50	260	53	47	Poor growth
5	60	260	8	92	Mouldy growth

The need for further co-operative research

From what has been said above, it would seem that at present the best source of iodine is from plants. Methods have been developed by means of which the iodine content of plants can be increased materially. It must be granted, however, that the best methods have not yet been attained and that there is room for further improvement. One thing is certain, however, that these or similar methods will be used more and more because they are simple, cheap, practicable in both rural and urban areas, and at the same time they are more effective than the methods now used or advocated.

What influence these findings may have on the co-operation of Botany and Medicine, only the future can tell. It seems, however, that vegetables grown for the prevention of endemic goitre will require iodine mixed in fertilizers, or in such form as may be found best in the future. We have reached a stage in scientific development where a hearty co-operation among the workers engaged in various fields must be desired more and more, which means a great deal to humanity at large.

It is a pleasure to acknowledge the help rendered by Mr. Ray Glynn, Assistant in the Biology Department of this institution.

Summary

Iodine with reference to thyroid gland function is discussed from the chemical, physical and physiological standpoints. It is shown that its use in the prevention and treatment of endemic goitre is inevitable. From the writer's experiments as well as from other data, it is concluded that inorganic iodine or iodine in combination with inorganic compounds has certain serious disadvantages. In this respect, addition of iodine to water, iodized salt and iodine tablets have been considered from various standpoints.

It has been pointed out by recent researches that atomic iodine in combination with organic molecules is more satisfactory, permanent, and hence more effective in the prevention of endemic goitre. Two sources of

iodine, namely: from animal products, such as milk and sea food, and from plant products, are discussed. The merits and limitations of each are explained. It seems that iodine from plants may be the better source because it is comparatively cheaper, is easily accessible in any locality, and is more satisfactory in its more permanent effects. Two distinct methods of increasing iodine content of (a) vegetables and root crops, (b) cereals and other farm crops are described. Some additional data to that effect are also presented. The need for further co-operative research is also pointed out.

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Medical News

THE RAI SHAMBHU DAYAL SAHIB GOLD MEDAL

We have been asked to bring the following notice to the attention of the medical profession in the United Provinces.

(1) A gold medal called the 'Rai Shambhu Dayal Sahib Gold Medal' will be presented for the best prize essay on a public health subject to be announced each year.

(2) The subject of the next essay is 'A practical scheme for the improvement of the sanitary conditions of villages'.

(3) The competition will be open to the general public including the medical, public health and educational men in the United Provinces.

(4) The essay is to be written in Hindi and should not exceed 3,000 words in length.

(5) Essays should reach the Assistant Director of Public Health, Provincial Hygiene Institute, United Provinces, Lucknow, by August 1, 1932.

(6) The name and address of the competitor must be distinctly written on each essay submitted and the envelope should have the words 'Prize Essay' in the top left hand corner.

(7) The Director of Public Health, United Provinces, shall judge the merit of the essay and his decision with regard to the award of the medal shall be final.

(8) No correspondence will be entered into on the subject of competition.

(9) No essay will be returned.

Current Topics.

Ulcus Tropicum, with a Reference to its Treatment by X-rays

By T. R. F. KERBY, M.R.C.S. (Eng.), D.M.R.E.
(Abstracted from the *Lancet*, January 30th, 1932, p. 235)

THE condition is found in all tropical and sub-tropical parts of America, Africa, and Asia. It is very much more common in men than in women and children. Indeed, to see a tropical ulcer in a woman or child is, in my experience, quite rare.

ÆTIOLOGY

The assertion is repeated in many textbooks that ulcus tropicum is frequently a tertiary manifestation of syphilis or yaws. With this I do not agree, except in so far as it is possible that an untreated tertiary syphilide might, by superinfection, become a tropical ulcer. In my experience, antisyphilitic measures have little therapeutic value in tropical ulcer and there should be little room for error if the Wassermann reaction is taken in all doubtful cases.

Vincent has found fusiform bacilli and spirilla in smears from these ulcers, and Prowazek, Holbach and Todd attach some ætiological significance to the *Spirochæta schaudinni* (Prowazek, 1907), a very active motile spirochæte 10-20 μ in length with a well-marked undulating membrane and a short flagellum. It was suggested that this organism was transmitted by a leech but, on inquiry, I can find no evidence associating the occurrence of tropical ulcer with leech bites in Northern Rhodesia.

The starting point of an ulcer is always, in my experience, a scratch, wound, or insect bite, and frequently one finds a new ulcer arising from the site of an old ulcer previously treated. The assumption, in my opinion, is that secondary infection has supervened on the primary trauma.

With these local causes it is nearly always found that the ulcer is in an exposed position—*e.g.*, leg,—on a poor adult male with naked legs and feet. In this connection it is interesting to observe that the incidence of ulcus tropicum among the native employés of the Rhodesia railways has decreased enormously wherever the wearing of puttees has been insisted upon. It is usual to find that the patient's resistance is lowered by debilitating diseases such as ankylostomiasis, malaria, scurvy, or filariasis, which are so widespread in tropical Africa.

Tropical ulcer and veld sore are now regarded as two separate conditions. The differential diagnosis can be difficult, and no work has been done in this country on the association of the *B. diphtheriæ* with veld sore. But treatment by antidiphtheritic serum is rapidly successful in a true veld sore and has no effect on a tropical ulcer.

Diet and calcium deficiency seem to have a very considerable ætiological significance. The well-fed and well-paid native is rarely found with a tropical ulcer. In my practice all these cases are put on a generous diet immediately on admission; calcium and cod-liver oil are administered daily, and any intercurrent disease is treated.

PATHOLOGY

Unfortunately, no distinctive features have been found on pathological examination. A mass of granulation tissue is seen, usually covered by a fibrinous layer containing detritus and spirochætes and bacteria, together with some eosinophile leucocytes.

Healing is apparently never spontaneous, and in any case is always slow and proceeds by granulation from the periphery, leaving a thick, white scar which at first is soft and easily broken down, with a consequent renewal of the ulceration.

SYMPTOMS

At the outset there is a painless swelling which is soft and may be fluctuating. Then a break in the skin is seen from which a serous discharge exudes. This is followed by rapid breaking-down into an ulcer with raised, thickened edges. The ulcers are usually single and rounded but may be multiple. A greyish-yellow, foul-smelling slough now forms and, if no treatment is given, the ulcer rapidly deepens. It may also extend laterally, and there is an occasional tendency to the serpiginous type, but usually the spread is by increase in depth, so that in a remarkably short time muscles and tendons are involved and periostitis develops. This may lead to a diffuse osteitis and osteomyelitis with huge involucra and sequestra, as a result of massive necrosis. Subsequent contractures and deformities are most disabling. On occasion, the untreated case progresses to septicæmia and death.

VARIOUS METHODS OF TREATMENT

It is a remarkable fact that very little space is devoted in the standard works on tropical medicine to this disabling condition. This can, I think, only be explained on the supposition that no really satisfactory treatment has yet been evolved, and no specific treatment is possible owing to the general doubt regarding ætiology. It is for this reason that, as suggested in Manson's 'Tropical Diseases', I decided to try the effect of x-ray therapy. Before discussing a series of cases treated by radiotherapy I propose to outline the more generally-used methods of treatment.

An essential preliminary to any form of treatment is to cleanse the surface of the ulcer. This may be done either by using powerful caustics, such as pure carbolic acid, or by curettage. Personally I prefer curettage under local or general anaesthesia, and I regard it as essential to remove all sloughing and unhealthy tissue and also to cut away with scissors the undermined and overhanging edges. All my cases are treated in this way and, in my view, it is useless to hope to heal one of these ulcers, unless a thorough preparation of this kind is first undertaken.

Another feature which must be common to all forms of treatment is the elimination of any intercurrent affection of the type mentioned under aetiology. With this goes the natural corollary that a generous mixed diet with an abundance of green vegetables and fresh fruit must be ensured.

The only drug I use now is calcium in conjunction with cod-liver oil, for I consider that deficiency in lime salts is a marked feature in the natives of some parts of this territory. I have not found that opium has the specific effect on the phagedenic process that is claimed for it. Nor does iodide of potash seem to make any considerable difference.

Local treatments.—A multitude of lotions and ointments have been used by numerous people. The object of all is the same—viz, to stimulate the callous and slowly healing tissues to greater activity and more rapid healing. The most popular in the textbooks is 1/1000 perchloride of mercury lotion followed by 5–20 per cent. protargol ointment or 8 per cent. scarlet-red ointment. In the Congo Belge good results are claimed for a powder containing iodoform 2 parts, calcium chloride 20 parts, sodium bicarbonate 78 parts. I have not found this remarkably successful, though it has occasionally been useful. Wet eusol dressings, saline, zinc sulphate, and other lotions have been used. Of the dyes, I have tried methyl violet, brilliant green, and acriflavine. Here again some measure of success can be claimed but results are not consistent. A powder containing zinc oxide and iodoform is popular, and certainly produces a fair number of good results, but, after trying all the remedies already mentioned, I have no hesitation in saying that easily my best results were obtained by a thorough curettage with the application of 'bipp'. Following this procedure the ulcer is treated on general surgical principles by eusol or other dressings.

Skin grafts.—When there is a large area to granulate up, skin grafts are of the greatest value in hastening healing, but two not inconsiderable difficulties have to be met. One is the attitude of the native patient who objects to having a new 'chilonda' (i.e., ulcer) made, as he thinks, to obtain the skin for grafting, and the other is the great difficulty in preserving asepsis once the grafting has been done.

Antivirus.—Six cases have been treated *ab initio* by staphylococcus antivirus. Unfortunately my work in the Native Hospital was interrupted at this point, but there is no doubt in my mind of the remarkably good effect the antivirus had in cleaning up an ulcer which had received no other treatment. I am definitely of opinion that this line of treatment is well worth extended trial.

Vaccine therapy.—Investigations are in progress in Salisbury, Southern Rhodesia, with a view to the production of a specific vaccine. The Director of Veterinary Research informs me that so far no 'stock' vaccine has been evolved and, as no facilities exist here for the making of vaccines from swabs, I have been unable to investigate this line of treatment.

Strapping.—When the ulcer is clean and healing from the edges, firm strapping with zinc oxide strapping is definitely useful. I have had no opportunity of trying elastoplast bandages on these cases. But as the question of expense is of paramount importance, I have abandoned my original scheme of firm strapping of the whole circumference of the limb and now employ a piece of strapping which overlaps the healing edge of the ulcer by one inch. I find that this may safely be left in position for a week. When it is removed there is always a certain amount of discharge but, provided that the preliminary curettage has been thorough and no necrotic material has been left behind, it will be found that surprising progress in healing has been made. I think that the advantage of strapping lies in the fact that the edges of the ulcer are approximated and the delicate epithelial cells are protected from injury.

General.—I have come to the definite conclusion that isolation of these cases in so-called 'tropical ulcer wards' is not necessary and, in fact, is to be deprecated. I now admit them to the general surgical ward, where

their beds may be alongside a 'clean' hernia or gastro-enterostomy case, and the orderlies are trained to exercise the usual care while doing dressing and are told that transference of infection should never occur. So far I have not had any case of infection of a clean wound from a tropical ulcer in the ward. This result is, in a large measure, due to the fact that the sister personally supervises every dressing; and here I wish to emphasise a point which I regard as of the utmost importance—namely, that, good as African orderlies can be and often are, the best results are only obtained by rigid supervision of all their work by the medical officer or sister on duty. If dressings are left to the orderlies without supervision I find that a definite increase in the length of stay in hospital results.

I regard rest in bed as important in the early stages and allow the patient to walk about only when healing has definitely begun and the ulcer has been strapped.

X-RAY AND ELECTRICAL THERAPY

I have searched in vain for any references to previous work on the treatment of *ulcus tropicum* by x-radiation. The librarian at the Royal Society of Medicine has been unable to help me, after a kind and careful search. Two lines of treatment have been tried, each in a series of 25 cases.

Method A.—First treatment: 5 H. at 80 k.v. unfiltered; 23 cm. F.s.d.; 3 m.a. Area irradiated includes a margin of about 1 cm. of skin around ulcer. Ten days later a series of five weekly doses of 2 H. at 100 k.v.; 23 cm. F.s.d.; 3 m.a.; 0.5 mm. Al. filter.

Method B.—The only difference lies in the fact that in this method I have omitted the first unfiltered dose and given a series of six doses at seven-day intervals of 2 H. at 100 k.v.; 23 cm. F.s.d.; 3 m.a.; 0.5 mm. Al.; again including in the area irradiated a margin of the skin around the ulcer.

During the course of x-ray treatment the ulcers were swabbed daily with saline, and plain lint soaked in saline was the only dressing applied. As I have mentioned previously, all necrotic tissue was first curetted away under general anaesthesia before the course was begun.

ZINC IONISATION

Twenty-five cases were treated by this method. I have found it particularly useful in healing up residual areas of ulceration which, though clean and apparently healthy, refuse to granulate up and epithelialise. I have been unable to satisfy myself that this method has any great practical value in treating the large tropical ulcers *ab initio*, and on the whole I am inclined now to reserve ionisation for the occasional treatment of small residual indolent patches of a partially-healed ulcer. For ionisation a 1 per cent. solution of zinc sulphate has been used and the current intensity has been at the rate of 2 m.a. to the square inch for 20–30 minutes.

The type of case chosen for x-ray therapy was the chronic indolent type which had existed for some time or had resisted other methods of treatment. My reason for this choice was that I find that when a case comes up early it is comparatively easy to heal the ulcer by the method I have outlined, and consequently there seemed to be no necessity to use an expensive (and not always available) method of treatment. The results of x-ray therapy are, in my opinion, distinctly disappointing. I have been quite unable to satisfy myself that any appreciable improvement was caused by x-radiation, and the eventual healing of the ulcers treated by this method was, I think, due to the preliminary curettage and the daily cleansing of the ulcers.

METHOD OF TREATING *ULCUS TROPICUM* WITHOUT PRELIMINARY CURETTAGE

As many cases of this condition occur in native districts and are attended at dispensaries which are only occasionally visited by a medical officer, I have tried to work out a method of treatment which can be carried out with more or less success by the African

orderly in charge of the dispensary. A method that has been reasonably satisfactory in the case of recent ulcers has been to give the ulcer a preliminary thorough swabbing with hydrogen peroxide (and here the orderly needs a heavy hand if the method is to be effective) followed by boric fomentations and then eusol or other

left *in situ* for a week, at the end of which time it is removed, the ulcer is cleaned up with eusol, and the strapping is reapplied. About this time the patient is usually allowed to get up and stroll about the grounds. In some cases he is now allowed to come up as an out-patient.

Method	Ulcers treated	Average duration before beginning treatment (patient's statement)	Average number of days before healing was complete	Healed	Unhealed
X-ray therapy 'A' ..	25	4 months	98 days	20	2 absconded. I died. 1 handed over to surgeon. 1 still in hospital.
X-ray therapy 'B' ..	26	4½ months	99 days	21	1 died. 4 still in hospital.
Zinc ionisation ..	25	As this treatment was usually employed in conjunction with, or after, other forms of treatment, no figures can be given.			
'Bipp' ..	25	1 month	31 days	25	Nil.
Peroxide, fomentations; eusol dressings.	25	3 weeks	51 days	24	1 absconded.

dressings. This method is, however, quite unsuitable for the chronic ulcer and, in my opinion, these cases should be sent immediately to the nearest station at which there is a medical officer. A record of results of cases treated is given in the table.

CONCLUSIONS

1. *Prophylaxis* depends upon: (a) Adequate nutrition and freedom from debilitating disease. (b) Protection of exposed parts from trauma (*e.g.*, labourers should wear puttees and shoes). (c) Prompt application of antiseptic dressings to all minor injuries. (d) Early application for treatment when an ulcer begins to develop. (e), (c) and (d) involve the provision of trained medical orderlies at dispensaries, or in villages, who will supply dressings and educate the native mind. All gangs of labourers should have a medical orderly attached to them.

Of one thing I am convinced, and that is that these ulcers should almost never occur in natives employed by Europeans. A very small amount of supervision should suffice almost entirely to prevent the occurrence of *ulcus tropicum* in industrial areas.

2. *Treatment*.—I favour the following routine treatment:

(a) As soon as possible after admission, the blood, urine, and faeces are examined and a routine physical examination of the patient is made. Treatment is begun at once for any pathological condition discovered in the examinations, and the patient is put on a liberal mixed diet with as much fruit and fresh vegetables as possible. If no other drug is found necessary (to treat intercurrent disease), calcium lactate and cod-liver oil are prescribed. The patient remains in bed, and the bowels are kept well open.

(b) Under general anaesthesia the ulcer is curetted with a blunt curette and the undermined and indurated edges are clipped away with scissors. All pockets are well opened and, if necessary, the bone is scraped and sometimes the medullary cavity will require to be opened.

(c) Bipp is now packed into the ulcer, lint applied, the limb firmly bandaged, and the patient returned to bed. The number of times Bipp is repeated is a matter for the discretion of the medical attendant in the individual case. It rarely needs repeating after five or six days.

(d) Wet eusol dressings are then applied twice daily until the ulcer is healthy and clean and a fine ingrowth of new skin begins to appear.

(e) Zinc oxide strapping is then applied so that an area of one inch around the ulcer is included. This is

Some Points in Connection with the Treatment of Glaucoma

By R. H. ELLIOT, M.D., F.R.C.S.

(Abstracted from the *British Medical Journal*, December 26th, 1931, p. 1169)

From the earliest days of the operative treatment of glaucoma, dating back over seventy years, there has always been a tendency towards the establishment of two schools of thought: that which favours operative measures and that which relies on medical treatment alone. Formerly there was the strongest antagonism between the two. The more generally adopted view of to-day is a compromise in which both methods are made use of, each case being judged on its own merits. It may be said, without fear of challenge, that no case should be submitted to operation if the use of miotics, the employment of massage, and attention to the patient's general health suffice to arrest the course of the disease and to keep the case *in statu quo*.

MIOTICS

Of the two miotic drugs pilocarpine is to be preferred to eserine in the great majority of cases for several reasons: (1) It causes less conjunctival irritation. (2) It does not give rise to the same measure of spasm and headache, for it acts more quietly and evenly. (3) Suitably employed, it maintains the necessary contraction of the pupil quite as well as its more powerful rival.

When it is a question of producing miosis as rapidly as possible in a patient with congestive glaucoma, the case is quite different, and eserine is the drug to employ. Pilocarpine should be used in a weakest dose that will maintain efficient miosis, and should be given last thing at night, first thing in the morning, and about 3 o'clock in the afternoon. This timing is important, for, (a) rises in pressure occur frequently during sleeping hours, owing to the withdrawal of the pumping action on the canal of Schlemm exerted by the ciliary and iris muscles; and (b) the afternoon is, for many patients, a time of fatigue in which the vasomotor tone falls, and the pressure in the eye is consequently in danger of rising. If medical treatment is to be fairly tried, miosis must be sustained. Sometimes trouble is experienced owing to conjunctival irritation set up by the drug. This can best be combated by the use of silver collosol, alternated with hazeline eye-drops (40 minims to the ounce of rosewater). It sometimes, however, though fortunately rarely, becomes a very serious factor in the case, making the maintenance of miosis difficult,

if not impossible. Operative intervention may then become a necessity.

MASSAGE

The importance and value of ocular massage in glaucoma does not seem, even now, to be sufficiently appreciated. There are certainly quite a number of cases under treatment for raised tension of the eye in which massage is either not being used at all or else not to the fullest advantage. The technique is simple, and any patient can be taught to use it for himself. Both hands should be used, and the index or middle fingers should be placed on the upper lid as far apart as possible and with the eyes looking downward. Alternate pressure with each finger in turn will rapidly lower the tension of most eyes, but the pressure must be made toward the centre of the eye, whereas the great majority of patients employ a stroking movement which is of little value. Strong pressure should not be used; light, quick, almost butterfly movements will do more good and will not hurt the patient at all. In fact, he often offers the comment that he 'hardly felt the massage, and does it much stronger himself'. It is, however, the light, quick pressure, with the fingers far apart and with every stroke toward the centre of the eye, that is by far the most effective.

GENERAL RULES

Remembering the influence of vasomotor exhaustion on glaucoma, there are certain practical rules which should be impressed on every patient; indeed, it is well to write these down for them.

1. *Avoid over-fatigue.*—Few things are more dangerous to the man who is threatened with congestive glaucoma than allowing his vital energy to run low. He should work within reason; indeed, this is much better for him than idleness, but he should never exhaust himself. Exhaustion means a lowering of the vasomotor control and a consequent provocation of local congestion, especially in the cerebral circulation. On the other hand, to cut him off from work which engages his attention, diverts his mind from his trouble, and fills his time profitably, is bad and not good, though it is often done. Moreover, the intermittent action of his iris and ciliary muscles is a safeguard of which he is to some extent deprived if he is stopped from reading and writing, and kept in the shade. I have often released a patient from this strict regime of doing nothing, and have never seen harm follow. On the contrary, the patient has benefited materially, and has become more cheerful and brighter in his outlook. The influence of the mental on the physical condition in glaucoma is a psychological factor of great importance. The unoccupied man not only has time to fret, but the very fact that occupations are forbidden predisposes him to do so. Allow him to engage his mind and you cut the vicious circle.

2. *Get regular sleep.*—Much of what has been said under the last heading applies again here. If necessary, the aid of drugs, such as luminal, should be invoked. Glaucoma patients are often elderly, and the bogey of the drug habit can be made too much of in such cases, a view now more widely held than formerly.

3. *Take regular meals and avoid alcoholic excess.*—It is unwise to cut a patient off all alcohol or to limit his diet too strictly. Interference with the habits of a lifetime is often mischievous, and, to many patients, means a real deprivation. While most elderly patients are better the less alcohol they take, there are a few who are benefited by moderate indulgence in this drug.

4. *Avoid stooping and all sources of strain.*—Running for trains or buses, stooping down with the head low, whether for tying a boot-lace or for weeding in the garden, lifting heavy weights, pulling on straps and cording, the straining of constipation, and any other form of strain should be avoided. This does not mean that the patient is to be an invalid. He can put his foot on a chair to tie his boot-lace; he can weed with a long-handled hoe; and he can get the younger members of his family to strap the holiday trunks. If he

cannot catch the train standing in the station he can wait for the next one. He must learn his limitations and live his life as fully as possible within those limitations.

5. *Avoid all causes of anxiety.*—This is easier advice to give than to follow, but it is important to give it for all that. Once the importance of avoiding mental strain is realized, there is a great deal the patient can do in determinedly relegating to his subconscious mind many of the troubles of his daily life. Moreover, this is a detail in which friends and relations can do much to help. Few things have impressed me more in a long experience of this disease than the frequency with which sorrow or the crushing burden of business or family trouble proves the final factor in determining a congestive attack.

GENERAL MEDICAL TREATMENT

It is the task of the general practitioner to examine his glaucoma cases very thoroughly, with a view to improving in every possible way the general standard of health. Much that has been said and written on various bodily conditions in connection with the ætiology of glaucoma is open to question, but it is certainly important to keep the patient as healthy as possible, and so to help him ward off attacks. The subject is too wide to be dealt with further, and can be left to the practitioner's discretion and management. The mistake of using atropine instead of eserine in congested high-tension eyes is fortunately becoming much rarer with the advance of the standard of medical knowledge; but a warning may be permissible against the use of preparations of belladonna, either internally or externally, in all doubtful cases, especially when there is a family history of glaucoma.

Assuming that regular treatment has been carried out by the practitioner, it becomes the duty of the ophthalmic surgeon to test the patient from time to time with a view to ascertaining whether the condition is really stationary or otherwise. In many cases a first examination does not qualify a surgeon to give a definite opinion. It is only by making careful measurements and by comparing the records from time to time that he attains certainty in the majority of his cases. The following factors serve to guide him. The order in which they are dealt with is intentional.

1. *Tension of the eye.*—It ought to be unnecessary to-day to emphasize the importance of tonometer readings. These should always be made under a local anæsthetic. If the drug chosen is also a mydriatic, the patient should not be lost sight of until miosis is re-established, even if it is necessary to admit him into a nursing home for the purpose. Reliance on the digital estimation of tension, though apparently not obsolete, is an anachronism. A difference in the tension of the two eyes is a sign of grave significance, especially if it does not yield quickly to medical treatment.

2. *Central visual acuity.*—It is often hard to get a patient to realize that this may be quite unimpaired, though the glaucoma may be steadily advancing. Indeed in the great majority of non-congestive cases, this is the rule. A fall in central visual acuity is a distinct sign that intermittent congestive attacks have been taking place, even though such a possibility may not have been recognized either by the patient or by his medical attendant. The explanation of the oversight may be that the increases of ocular pressure occur only at night in the early history of the case.

3. *Curtailment of the visual fields* associated with a difficulty in orientation is a sign of grave significance. Constriction of the nasal side of the field and the appearance of a Roenne's step have in no way lost their importance in the past twenty years.

4. *Enlargement of the blind spot, or paracentral scotomata* are of very great importance, especially if the defects are increasing in size. They point to dangerous interference with the nerve fibres as they emerge from the optic disk. Complaints by the patient that his vision is not so good as it used to be are sometimes disregarded by the surgeon because there is

full central vision in the eye. An examination with a scotometer will often provide complete justification for these complaints, which are usually founded on very real grounds.

5. *Failing light-sense* is a symptom which should not be disregarded. It is never absent in progressive glaucoma, and it is certainly one of the most distressing sequels that remain, in a large percentage of cases, long after the pressure has been relieved by successful operation. It makes things very difficult for the patient in a poor illumination, or when he goes from darkness into a bright light, or *vice versa*.

6. *Cupping of the optic disk*.—This is perhaps the sign that most people would expect to see placed first, and it may be thought wrong to put it so late. It is the one most easy for the general practitioner to recognize, and in its typical condition, in which the whole disk is pushed backward, it is highly significant. At the same time, it is to be remembered (1) that it may be imitated by other conditions, and so there arises a common source of error in diagnosis, and (2) that a very marked glaucomatous cup may persist after all signs of the progress of the disease have been brought to a stop by medical or other means. It is not necessary to enter here into the differential diagnosis between glaucomatous and other forms of cupping. Those who are interested will find the subject fully dealt with in various textbooks. There are two points, however, to which special attention should be drawn, for they are both pregnant with meaning: (1) Considerable atrophy of the optic nerve accompanies all cases of advanced glaucoma. The pallor of the disk is of grave significance when associated with complete cupping. *The more pronounced the atrophy, the graver the prognosis of the case.* (2) An arterial pulse, on light pressure with the finger on the eyeball or after the use of cocaine or any other mydriatic, has long been recognized as a grave danger signal. It is a custom with some surgeons to use a mydriatic deliberately in order to elicit this sign. I feel mostly strongly that it is not worth the risk involved. In the past eighteen years of practice in London I have seen a number of cases in which glaucoma has been induced by the instillation of various mydriatic drugs, including cocaine, homatropine, and atropine, and in one by the injection of cocaine for the removal of a tooth. In the majority of cases where atropine was responsible, the drug had been used to produce mydriasis in order to improve vision in patients suffering from nuclear cataract. This is a most dangerous procedure. The performance of an iridectomy is vastly preferable, as it brings all the advantages of the drug with none of its risks. An arterial pulse is a sign that should always fill the surgeon with anxiety, for it shows that the eye is on the edge of a glaucoma crisis. However it may have originated, the patient should not be let out of sight until this sign has disappeared. He should be kept in bed under the influence of sedatives, eserine should be used freely, a brisk purge be given, and leeches applied to the forehead.

The surgeon will weigh all these points before deciding in favour of an operation. It is very important that he should not be in a hurry, but it is essential that he should not delay a day longer than necessary, once he has satisfied himself that non-operative treatment is failing to hold the disease in check. I have stressed this point for very many years. Operation at the earliest moment was one of the tenets of von Graefe some seventy years ago, and de Wecker earnestly supported his master in this detail. On the other hand, no case of glaucoma is at too late a stage for trephining, always provided some sight is left. Indeed, in acute cases, even when all sight has gone, recovery to some extent may occur after relief of pressure. Needless to say that, in dealing with late material, a certain number of failures are inevitable, but there are some things that can be said without the least fear of contradiction. (1) Given an early diagnosis, one should rarely, if ever, have a failure in sclero-corneal trephining. (2) The later the case the greater the risk of failure, and the greater the probability that even a technically perfect

trephining, resulting in an ideal scar, may not suffice to stop the progress of blindness. Few cases are more disappointing than these. (3) The earlier operation is done, the better the prognosis. (4) No case, however late, is hopeless if some vision still remains.

THE PROGNOSIS AFTER OPERATION

As already indicated, the later the operation the worse is the prospect, though the latter is not hopeless even in very late cases in which the field is reduced to a small central area. The higher the tension is before operation the greater the prospect of a material improvement after intra-ocular pressure is relieved. This is only what might have been expected, for the interference with vision under conditions of high ocular pressure is partly due to anæmia of the retina and partly to atrophy. The longer the condition has persisted the greater the atrophic element in the damage, and *vice versa*. Hence, in chronic cases the surgeon may be satisfied if he can keep the vision as he finds it, whilst in acute ones he can hope for a considerable restoration of function as soon as pressure is relieved.

In any operation for so serious a condition as glaucoma it is unwise to make light of the risks involved. To do so may lead to very unfortunate results. On the other hand, there is no need to exaggerate the risks in ordinary early and straightforward cases. The surgeon's task is to put all the facts before the patient, or before his relatives, and to leave the burden of a decision on his or other shoulders. In dealing with cases of advanced glaucoma it should be pointed out that it is a relentless disease, and, when progressive, leads to certain blindness. In these circumstances, it is well worth while to take any means, however hazardous, that offer a possibility of escape. It is always an open question whether, in desperate cases, one should put this so bluntly to the patient himself. His relatives should be told the naked truth, and should be left to decide what is to be said to him, it first being pointed out to them that, both during the operation and in the succeeding convalescence, the patient's mind is supernormally active, and that, consequently, morale is a very important factor in success. The conditions are very different from those that prevail immediately before and in the days that follow many general surgical operations in which the patient is too ill or too drowsy to be able to take any interest, either in his condition or his prospects. Once an operation has been decided on, everything should be said and done to keep the patient's hopes and courage as high as possible. He will then be better operation material for the surgeon. On the other hand, if he knows that his chance is a small one, and if his courage sinks, his prospect is decidedly poor. The task of encouraging him is made more easy by the excellent results that so often attend very late operations.

EXPECTATION OF LIFE

This is a very important factor in a disease most of whose subjects are advanced in years. The surgeon makes periodical examinations and convinces himself, in certain cases, that the disease is progressive. This alone does not suffice. He must measure the rate of the downward drift, and must weigh this against the prospect of life in each individual, not forgetting that very old patients often stand the operation of sclero-corneal trephining very well indeed. The family history of longevity and the vigour of the subject have to be weighed in the balance against the rate of progress of the disease. Then again, there are the patient's personal predilections. One man would rather be dead than blind, and many of us will sympathize with him in this. Another dreads an operation, and will do anything possible to avoid it. The general practitioner will often prove most helpful in these cases, especially when every side of the case is put plainly before him. There is the further advantage that he is the patient's friend, with no suspicion of an axe to grind, and with the power of bringing a trained intelligence to bear on the difficult position which confronts his patient.

Reviews

HISTORY OF SCOTTISH MEDICINE.—By John D. Comrie, M.A., B.Sc., M.D., F.R.C.P. Second Edition. Vols. I and II. London: Baillière, Tindall and Cox, 1932. Pp. 852, with 2 plates and 404 figures in the text. Price, 50s.

THE author is Lecturer on the History of Medicine in the University of Edinburgh. It is therefore at once apparent that the work proceeds from a pen more competent to deal with the subject than any other. It is fully documented, whilst the wealth of illustrations shows the enormous amount of material that must have been accumulated and consulted by the author in the course of his researches. Whilst almost any period, or any of the figures that play their part in the pages, afford opportunities for further monographs, it is probable that as a general account this will stand for several decades at least as the authoritative exposition of the subject.

The first nine chapters, some 200 pages, take the story from the Stone Age to the end of the 16th Century. Much of what is included one has encountered elsewhere in other works on the development of medicine, but it is something new for the profession to learn that the 'Legions on the Wall' commemorated at least some of their medical officers—whilst the fact that one of them, whose memorial tablet is illustrated, bears mention of the fact that he was on double pay indicates that 'special and personal allowances' were no more unknown in bureaucratic medicine under Rome than they are under Whitehall and Delhi, and presumably caused similar heart burnings! One wonders whether 'Medico Duplico C. Acillobassus' thus commemorated was the Roman equivalent of the brass-hatted A. D. M. S. of to-day!

From other books one has always understood that the status of the profession in the Middle Ages was a low one, but, with true perspicacity, this does not seem to have been the case in Scotland, where not only was some knowledge of the art of healing apparently part of a gentleman's education, but culminated in a Royal Amateur, James IV, who paid patients to let him try his hand on them.

To those who recall the controversy in *Nature* shortly after the War on whether the then-recently-exhumed skull of King Robert the Bruce showed signs of syphilitic bone absorption, and the wrathful letters which emanated from the other side of the Border on this subject, it will not be extraordinary to see the probable cause (the skull is illustrated), attributed by the present author, to leprosy.

In connection with this the details of the retreat northward of this disease is extremely interesting, and the fact that the last native leper in Great Britain was a Shetlander as late as 1798.

In preventive medicine Scotland must have led the rest of Europe. The classic instance of the recognition and regulation by the Baillies of Aberdeen of the venereal origin of syphilis will be known to everyone, but the Plague Regulations of 16th Century Scotland would seem to be centuries ahead of their time. In this country especially the sanitarian might long for the ever-ready gibbet which awaited the contravener of these regulations!

Passing from mediævalism to the regular development of medicine in the 17th Century, the story is more familiar, running parallel with the history of medicine in most countries of Europe, but to Scotsmen the rise of the medical schools of their respective universities will prove a fascinating tale, even though those of the other four may claim that the youngest of the five has had far more detailed treatment, perhaps inevitable seeing the author's position, though we who can claim Edinburgh as our alma mater may boast that it is only in her cultivated tranquil atmosphere that traditions can suitably survive. Cultivated certainly, for at the

close of the Stuart period Edinburgh was apparently the only place in Scotland where it was possible to get a bath and the luxury was expensive!

Of individual diseases one wonders that a fuller discussion of 'Sibbens' is not given. If not syphilis, it was surely a spirochaetal disease. That it was West Indian yaws seems unlikely, though it yielded to mercury. The disappearance of malaria between 1780 and 1810 is lightly touched on, while a list of sick in hospital as late as 1729 shows that both benign tertian and quartan were present, though the fact that the latter was in a dragoon suggests that the patient was really infected in the quartan focus that then existed in Holland.

Those in charge of the Ranchi Mental Hospital will be glad to note that some of their methods, such as treatment by music and dancing, were in use in Scotland a century ago.

The lectureship in entomology and parasitology, instituted about 1921, is omitted from the list on page 711. Had the author any tropical experience he would not have been so disparaging concerning the value of Sir William Leishman's discovery of the disease parasites of the genus that bear his name.

As is perhaps only right and proper, the whole subject is treated in the most serious manner, otherwise there is plenty of material for a jest or two to enlighten the long story of the centuries. Aberdeen seems to have remained unchanged in habits for in 1578 it is recorded that in the shire rats were unable to subsist, the well-known frugality of the Aberdonian thus resulting in immunity from plague! Had the craft of barber-surgeons maintained the monopoly to manufacture and sell aqua-vitæ within the burgh of Edinburgh granted them by James IV, it would indeed have been correct, as the author points out in an undramatic footnote, that the R. C. S. E. would to-day be one of the wealthiest corporations in the country, in which case they might have erected a statue to Alexander Monteath, who first discovered 'how to draw spirits from malt', an achievement but poorly recognized by his elevation to Deacon of the Corporation of Surgeons, and which merits at least a statue by his professional brethren, if not by the whole of his nation or the English speaking world.

R. S. W.

TUMOURS OF THE BREAST: THEIR PATHOLOGY, SYMPTOMS, DIAGNOSIS AND TREATMENT.

By Sir G. Lenthal Cheate, K.C.B., C.V.O., F.R.C.S., and Max Cutler, B.Sc., M.D. London: Edward Arnold & Co., 1931. Pp. viii plus 596; with 466 Figures and 18 Plates. Price, 50s.

THE following explanations and claims are given by the authors in the preface. The book is the result of thirty-five years' study of normal and abnormal conditions of the breast, based on combined clinical and microscopical researches with the help of whole breast microscopical and serial sections. The volume can thus be used as an atlas as well as a book of reference. There is an appendix at the end of the book on the technique of cutting whole sections of a breast, an author index and subject index.

There are fourteen chapters, the first four dealing with the anatomy and physiology of the breast, the congenital and other anomalies and the natural laws in pathological growths. The classification adopted is based on hyperplasia and neoplasia as they involve the epithelium and connective tissue together or separately, and a new term 'mazoplasia' is adopted for what has been called chronic mastitis in the past, because it is believed that this process is more physiological than inflammatory. Chapters six to ten describe epithelial hyperplasia, benign and malignant neoplasia and Paget's disease of the nipple. Chapters eleven and twelve deal with hyperplasia and neoplasia of the connective tissue, fibro-adenoma and sarcoma of the breast. Tumours of the male breast are then discussed and the final chapter is on the radiation treatment of carcinoma of the breast.

A valuable bibliography appears at the conclusion of each chapter.

The authors are to be more than congratulated on this handsome volume; the subject-matter and its arrangement, the beautiful plates and other illustrations, and the shedding of fresh light on the dark places in the physiology and pathology of the breast will be welcomed by all students of medicine, both before and after their final examinations. Many problems remain to be solved, but we can find here a lucid account of the almost magic properties of the ovarian, pituitary, corpus luteum and other hormones in their relation to the breast. The vexed problem as to the nature of 'chronic mastitis' and its relation to carcinoma is to a great extent solved by the recognition of the true nature of what is now called 'mazoplasia' and 'cystiphorous hyperplasia'; the former very rarely leads to carcinoma, but the latter is said to be responsible for 20 per cent. of such cases. A separate chapter is devoted to Paget's disease of the nipple, and the whole breast microscopical sections of this and other conditions afford a most valuable and graphic method of illustration. The true nature of Paget's disease will probably not be solved until we find the clue to the meaning of carcinoma.

The present position of the pre-operative and post-operative radiation of carcinoma of the breast will be read with great interest. In spite of many disappointments the hope is expressed that by some radiation methods results will be as good or better than by operation, without mutilation and other disadvantages of the latter procedure.

F. P. C.

MEDICINE: ANALYTICAL REVIEWS OF GENERAL MEDICINE, NEUROLOGY AND PEDIATRICS. December Issue, 1931, Volume X, No. 4.—Baltimore, U. S. A.: The Williams and Wilkins Company. (English Agents: Baillière, Tindall and Cox, London). Price, 21s. per volume and postage, 2s. 6d. Single copy, 6s. 9d.

THIS number of *Medicine* contains two illuminating articles, on primary carcinoma of the lung by Dr. B. M. Fried of Boston and on recent progress in yellow fever research by Dr. W. B. Sawyer of the Rockefeller Foundation, New York. A disease of comparatively rare occurrence, primary bronchogenic carcinoma presents difficulties in diagnosis as it is likely to be confused with other diseases, such as tuberculosis, abscess of the lung, diffuse pulmonary lymphogranulomatosis, and Hodgkin's disease. The difficulty is still more apparent as the primary focus is usually latent and masked and only the secondary metastatic manifestations in the brain and other organs give rise to symptoms calling for urgent interference. Dr. Fried has carefully studied 47 proved cases of the disease both from the clinical and pathological aspects and has presented a highly instructive monograph to his readers touching on all the details in connection with the incidence, ætiology, pathology, clinical symptoms and laboratory findings. The plates showing the microscopic and macroscopic nature of the malignant focus and the cerebral metastatic nodules are commendable, and show the great attention and care taken in their preparation.

In the second article, Dr. Sawyer narrates his experiences of yellow fever investigation in West Africa. The laborious task undertaken by Dr. Sawyer and his colleagues in establishing the identity of the yellow fever virus of South America and that of West Africa deserves more than passing notice. This finding is of far-reaching importance and opens up a new field for further investigation and research, particularly into the immunological problems which are looming large at present before the medical profession. Dr. Sawyer hopes that it may now be possible to discover an immune serum which will effectively combat the growing menace of yellow fever in different parts of the world.

R. N. C.

HUMAN PATHOLOGY: A TEXTBOOK.—By H. T. Karsner, M.D. Third Edition. Revised. London: J. B. Lippincott Company, 1931. Pp. xii plus 1012, with 18 illustrations in colour and 44 black and white. Obtainable from Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 33-12.

It is less than two years since the second edition of this book was reviewed by us. We will commence where we concluded our last review by saying that it is the best American book on pathology that we have encountered. We are apparently not alone in our opinion, as the publication of another edition within about two years can only mean that the last edition is exhausted. The book has only been enlarged by about thirty pages: this is a relief, as authors are sometimes inclined to add new matter without deleting the old. Additions and changes have been made throughout, but the sections on œdema, shock, rheumatic fever and diseases of the teeth have been entirely re-written. No radical changes have been made in the arrangement of the book.

We notice that the few criticisms we made in our last review have been ignored, but perhaps the author did not see our review, or, if he did, possibly he disagreed with us.

We can strongly recommend this book to the student, the practising pathologist and the teacher. It is an excellent book.

SURGICAL PATHOLOGY OF THE SKIN, FASCIA, MUSCLES, TENDONS, BLOOD AND LYMPH VESSELS.—By A. E. Hertzler, M.D. London: J. B. Lippincott Company, 1931. Pp. xvi plus 301, with 260 illustrations. Obtainable from Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 15-12.

THIS is the second book of the series of surgical monographs which are being prepared by Dr. Hertzler of the Kansas University. The subject is dealt with from the aspect of the surgeon rather than of the pathologist. The author explains in his preface that he has no quarrel with the pathologist or the science of pathology, but that he prefers to classify his tumours according to what they do, rather than what they look like under the microscope. By this it must not be imagined that he ignores the histological aspect of the subject; on the contrary, practically every photograph is accompanied by a photomicrograph of a section of the tumour.

About half the book is devoted to diseases of the skin but it should be understood that by diseases of the skin the surgeon-author means diseases which are amenable to surgical treatment, in fact all but the first thirty odd pages are devoted to tumours of the skin. The importance of this subject is very great as it is often a much more serious matter than just disfigurement; these small harmless-looking tumours if left alone or if treated incorrectly will so frequently give rise to metastasis and kill the patient, and it is therefore a subject in which the surgeon's judgment is a matter of very considerable importance. With regard to melanomata, the author has taken the view that melanomata are melanomata and not either sarcomata or carcinomata; he takes this view as a surgeon and is not prepared to argue the matter with the pathologist.

The second part of the book—on diseases of fascia, muscles and tendons—is short; tumours of these structures are comparatively rare.

Part III is devoted to diseases of the blood and lymph vessels. The reader will be disappointed if he hopes to find the subject of pathology of either varicose veins or aneurysm dealt with at any length as he might reasonably expect in a specialist book of this kind, but here again neoplasms are given pride of place and are well described.

The book will prove of great value to the surgeon. It is particularly well produced, with large clear type and beautiful illustrations on a good quality of paper.

Annual Report

ANNUAL REPORT OF THE GOVERNMENT
GENERAL HOSPITAL, MADRAS, FOR THE
YEAR 1930. SUPDT., MADRAS GOVT. PRESS.
PRICE, RS. 2-12

This annual report is always of importance owing to the wealth of interesting clinical material reported on. It is a great pity that more of the big hospitals in this country do not follow the lead of Madras and publish similar annual reports; innumerable cases of great clinical interest all over the country remain unreported on either in the journals or in annual reports.

The report for 1930 follows upon the usual lines, a brief general administration report, followed by the reports of the physicians and surgeons with case notes, and the report of the X-ray department. Each year sees a marked increase in the number of patients attending; for 1930 the figures were 83,299 new out-patients and 13,595 in-patients, including 5,999 and 1,939 Europeans respectively in the two groups. The total daily averages were 703 out-patients and 554 in-patients. The number of beds available is 554, but, as 168 beds are reserved for women and first and second class paying patients, there is always an overcrowding of patients, especially on the Indian male side. On an average 40 patients were admitted daily and 40 discharged. Surgical operations performed totalled 6,231 for the year. The average duration of stay in hospital was 10.86 days, and the chief infectious diseases dealt with influenza—333 cases, typhoid—230 cases, and smallpox—28 cases. Forty-two cases of tetanus were dealt with and 24 of hydrophobia. Three hundred and fifty-eight students received clinical instruction in the various departments of the hospital during the year. The total expenditure for the year was Rs. 7,90,257. During the year an advisory committee was appointed to deal with the affairs of the hospital; this consists of three official and five non-official members, and meets once a quarter; the members of the committee are expected to visit the hospital once every fortnight in rotation and to enter their remarks in a book kept for the purpose. It is of interest to note that 119 European and Anglo-Indian and 29 Indian candidates applied for training as nurses; it is often stated that there should be no difficulty in getting Indian candidates of suitable social status to train as nurses, whereas the actual facts are that far more Anglo-Indian than Indian candidates apply.

The introductory administrative report is followed by the professional scientific reports of the physicians and surgeons from which we take the following abstracts:—

Lieutenant-Colonel G. E. Malcomson, I.M.S., First Physician, notes on the following cases:—

Temporary uræmia after severe diarrhœa.—A Brahman patient, 52 years of age, was admitted on 26th July, 1930, suffering from anuria and severe hiccough. He gave a history of severe diarrhœa a few days previously for which he had been admitted to the cholera wards of the Infectious Diseases Hospital, given intravenous saline and discharged as not being a case of cholera. He had passed practically no urine since the attack and had persistent hiccough all the time. His other symptoms were intractable insomnia, epigastric pain, restlessness and prostration.

Lumbar puncture showed that the cerebrospinal fluid was under very considerable pressure.

In addition to the lumbar puncture, the treatment given was intravenous saline, general purgation by mouth and a magnesium sulphate enema daily. He was also given fomentations over the loins, and the usual sleeping draughts at bed time. Symptomatic treatment for hiccough was, as usual in these cases, quite useless. His hiccough only disappeared as the urinary flow became gradually established and the blood urea came down. A bed sore which he had on admission healed satisfactorily and he made a good recovery.

Acetonuria in adults.—Routine examination of one hundred and odd consecutive cases of pyrexia, including typhoid *Bacillus coli communis* and *Bacillus fecalis alkaligenes* infections, pneumonia, malaria, dengue, etc., revealed the interesting phenomenon of acetonuria, whose extraordinarily high incidence in febrile conditions has not been widely recognized till now. Only in 16 per cent. of them did any of the recognized symptoms of acidosis manifest themselves to an appreciable degree. In 25 per cent. of cases acetonuria persisted for more than five days in spite of treatment, whereas in others it was only of transient occurrence.

The following case is worthy of record:—

Hindu, male, 37 years of age, admitted for fever of three days' duration,—was delirious on admission—dry coated tongue, vacant expression of the face, rapid pulse, respiration rate and depth increased, no physical signs in the lungs or heart, liver and spleen not palpable, blood showed slight leucocytosis, agglutination against B. C. C. in 100 positive, C. S. fluid normal, urine contained ketone bodies—Wassermann negative.

Treatment and progress:—Glucose; intravenous sodium bicarbonate; nasal feeds; insulin injections. Temperature came down by lysis. Sanity returned with fall in temperature. Acetonuria persisted till the temperature touched normal.

Coronary thrombosis.—There were three cases of this condition. They had a typical history and clinical course. Two were above the age of 50 while the third was between 45 and 50. The first had the attack four months before admission to hospital where he stayed for eight weeks. We are reliably informed that he died suddenly six months after discharge. While this patient survived for nearly a year after the initial attack, the other two lived only for six weeks and seven weeks, respectively. It is interesting to note that the first two cases had auricular flutter with two to one heart block, while the third showed nodal rhythm.

Bacillus coli septicæmia.—There were three cases of *Bacillus coli communis* septicæmia in two of which *B. coli* was isolated from blood repeatedly and in the third positive agglutination of 1 in 200 against *B. coli* was obtained. All of them had a mild course. An interesting point worthy of note was that none of them had either the prostration or the anorexia of typhoid. In spite of their temperature they were feeling so well that they were often found out of bed and walking about. Tongue was perfectly clean and bowels were quite regular in all the three cases. Two of them had the typical temperature chart of a mild form of typhoid, while the third had the quotidian type of chart with rigors every evening. All of them got well with no special form of treatment.

Locomotor ataxia.—That locomotor ataxia is moderately common in Madras among Indians is shown by the fact that six cases presenting fairly typical symptoms were admitted into my wards during the year. Of these two were juvenile tabes, which may be briefly described:—

(1) A Hindu boy, 12 years of age, was apparently perfectly healthy about two months before admission, when for no obvious cause he had an attack of vomiting after every half-hour for about two weeks before this could be checked. He then noticed difficulty in walking particularly at night and he had several other sudden attacks of vomiting.

On admission to hospital he had a marked ataxic gait with loss of all the tendon jerks of his lower limbs. The muscular power was good, but he had well-defined pallanæsthesia and kinanæsthesia. Romberg's sign was present, the pupil reactions were normal and no tactile anæsthesia could be made out.

Both his blood and cerebrospinal fluid gave a positive weak Wassermann reaction. The latter showed some increase in the protein content and gave a weak parietic gold test.

(2) Hindu, male, 29 years old, draftsman in the Public Works Department offices, complains of heaviness in the stomach and difficulty in walking. There has been heaviness in the stomach for some years; difficulty

in walking has come on during the last few months. Owing to his general ataxia he has some difficulty in making his drawing accurate.

On examination, he was found to have a typical tabetic gait with extreme Rombergism. The muscular power was good, all the tendon jerks of his lower limbs were absent, and he had well-developed kinæsthesia and pallanæsthesia. He had slight ataxia of his arms, his pupils reacted sluggishly to light and his fundi were normal. His blood Wassermann was negative, but that of the cerebrospinal fluid was weakly positive. The latter gave a parietic curve with Lange's colloidal gold test.

He was given vigorous anti-specific treatment and re-education exercises based on the Frankel system. He improved enormously after some months and the ataxia became almost undetectable and he was able to rejoin his post and perform his duties without difficulty.

Hereditary cleido-cranial dysostosis.—A typical case of this condition in a Hindu girl, eight years of age, was admitted to the hospital during the year. This disease is excessively rare and hence worthy of mention. I have not seen a case yet described in an Indian. In this particular case there was no history of familial or hereditary incidence.

The right clavicle was entirely absent and the left was rudimentary, represented only by a piece of bone about 1½ inches long attached to the sternum. The interfrontal suture was wide and the anterior fontanelle unclosed. The condition is easily recognized by the undue motility of the shoulders which can be made to meet under the chin.

Lieutenant-Colonel J. M. Skinner, I.M.S., Second Physician, makes the following comments on cases of chronic dysentery.

Dysentery.—The after-effects of dysentery are varied but all tend to produce dyspepsia. Many patients have no such after-effects. In the case of those whose digestion seems to be permanently upset as the result of previous dysentery, much can be done to restore good health.

Case I.—European, 40, born in India, where he contracted dysentery. Since then dyspepsia has been a perpetual trouble with acute exacerbations about once a year or two years. While at school in England had his appendix removed with no benefit.

The various manifestations of the dyspepsia were flatulence, constipation, epigastric pain of variable position, but always definitely localized by the patient, and sometimes in the left iliac fossæ. The severe manifestations occurred about once a year or every two years and consisted of severe constipation, loss of appetite, epigastric pain, often severe and continuous. Tenderness was occasionally found in the epigastric or right iliac regions or umbilical region. The temperature was 100°F. occasionally, but was usually normal. There was no malaria, no leucocytosis and no ova in the fæces. Other organs all normal.

A second attempt to cultivate a bacillus from an enema of half normal saline gave a growth of *Bacillus shiga* of unknown type which agglutinated in the patient's serum, 1 in 200.

The patient was inoculated with autogenous Shiga vaccine every fifth day. The day after this vaccine, the patient was rather tired: occasionally a 'gone' feeling in the epigastrium was felt.

Doses: I began with two millions and reached seventy-five millions. This dose (75 millions) is too large as marked malaise resulted from it.

The patient from the first improved and is now very well; better than ever he has been for years and with no sign of indigestion, pain or tenderness.

Case II.—Male, European, 50. He has never had dysentery, but since living in the tropics has had constant dyspepsia. In general it is very mild, occasions no inconvenience, but every fortnight or so he has severe headaches with marked indigestion, epigastric pain, nausea, and sometimes actual vomiting. Bowels are always very constipated: mere relief of constipation

does not cure the headache. There was no tenderness. Other organs normal.

B. shiga was isolated from half normal saline enema. An autogenous vaccine gave relief from the first. Headache no longer troubles him and appetite and digestion are improved, and he has increased in weight.

Case III.—Female, European, 35 years, had bacillary dysentery 12 years ago, a severe attack. Since then the appetite and digestion have never been normal. She is easily upset and at irregular intervals, about every third to sixth month has a severe attack of gastro-enteritis, for which there is no ordinary ascertainable cause, the remainder of the household never being attacked.

She has to remain in bed for three days or more with severe headache and pain in the back and legs and fever, shivering and sweating. The motions are numerous 12 to 15 per day, all copious and watery.

Other organs normal.

Bacillus shiga was cultivated from the fæces: an autogenous vaccine was administered with good results.

Case IV.—Female, European, aged 38 years. This patient had severe dysentery with fever, colic, but no tenesmus and very copious and watery frequent (12 to 20) stools per day. No mucus or blood.

From childhood the patient had had poor digestion and liability to attacks of diarrhoea without adequate cause. At an early age she had a severe diarrhoeal complaint which was the starting point of her ill-health.

Other organs normal.

Bacillus pseudo-carolinus and *B. faecalis alkaligenes* were cultivated from the bowel and an autogenous vaccine administered in the convalescent stage. There was immediate response and ability to eat and digest articles which formerly were invariably the cause of an outbreak of diarrhoea or acute indigestion.

Case V.—European, aged 35 years. The patient had for several years suffered from frequent attacks of severe headache which for a day or two were completely incapacitating. There was no history of dysentery. The headache during an attack was intense. Vomiting was frequent. After the attack, the recovery was rapid. The liver was enlarged, but not tender on palpation.

Other organs normal.

A streptococcus was isolated from the bowel and an autogenous vaccine prepared with very good results. Appetite improved. Weight was gained, and headache attacks have stopped.

In the skin out-patient department 1,927 cases were seen during the year; these included 811 due to parasitic causes and 821 of leprosy. It has been stated that scabies may cause acute parenchymatous nephritis; but an examination of the urine of all cases of impetigo and scabies showed an incidence of albuminuria of only 1.6 per cent., and the association—if any—does not appear to be a very close one.

The Third Physician, Dr. A. Srinivasulu Nayudu, reports an interesting case of pneumococcal meningitis. The patient, a well-nourished Hindu female, 35 years of age, was admitted with a temperature of 105.8°F., in a state of deep unconsciousness. The pulse was rapid, and the heart sounds soft with reduplication of the second sound. Respiration was hurried with a patch of dullness at the right base. The corneal reflex was absent, with lateral deviation of both eyes to the left. The blood showed marked leucocytosis. The cerebrospinal fluid was under pressure, turbid, with a marked cellular increase, and pneumococci isolated on culture. Unfortunately the relatives took the patient away the next day, so that the case could not be followed up. A second interesting case reported was one of streptococcal endocarditis following on an attack of streptococcal bronchitis, the mitral valve being affected.

Dr. Nayudu, as Pathologist, reports on the pathological work of the hospital. The total number of pathological specimens examined during the year was 1,293, of which no less than 277 were malignant tumours or growths; the number of post-mortems held was 147, of which 59 were for medico-legal purposes, including 10 of poisoning.

Lieutenant-Colonel E. W. C. Bradfield was First Surgeon until September 29th, when Lieutenant-Colonel R. G. G. Croly, I.M.S., took over from him. We abstract the following notes from Colonel Croly's report, which is one of very great clinical interest:—

Gangosa.—A male, aged 20, sweet-meat seller. There were healed scars on the scrotum, left elbow, palate and fauces, and contracture of the mouth just big enough to admit a rubber catheter. A plastic operation was carried out and enabled him to open his mouth fairly well. He had received Neosalvarsan injection and three months' deep X-ray exposures. There was a tendency to bouts of fevers and breaking down of ulcers. All the ulcers have now broken down including those in the mouth.

Climatic bubo, now classified under the term of lymphogranulomatosis inguinale, was investigated. The disease is characterized by chronic inflammation of the inguinal group of glands of both groins which soon become adherent to each other and suppurate. When such an abscess is opened, there is not much pus while the glands will be found to be soft, necrotic in appearance, and the skin undermined. Unless the glands are removed by dissection, the condition will take months to heal and frequently the iliac and even the abdominal glands may be involved. There is no primary sore, though a history of exposure to venereal infection can be elicited in the majority of cases. One doctor infected through the finger definitely gave the incubation period as eight days. We have been able to confirm the observation that intra-dermal injection of matter from the bubo after sterilization causes a definite skin reaction and this is useful in diagnosis. Several gland masses were examined by Lieutenant-Colonel King, I.M.S., of the King Institute, Guindy, and he was able to grow an anaerobic streptococcus. This is referred to in the September issue of the *South Indian Medical Bulletin*, 1930. The following is the summary of cases:—

(1) An Indian Christian, male, age 31, was admitted for matted glands in the right side of the neck in August 1930. His left axillary glands were removed in August 1929. On 11th August, 1930, glands in the neck were removed and culture was positive for this anaerobic streptococcus. Radium application of 50 mgms. pad for five days was given. He is in good health now.

(2) S., 29, M., A. D., was admitted for suppurating glands right groin. They were dissected out and culture was positive.

(3) D., 37, male, A. I., was originally admitted for abdominal tumour. An exploratory operation showed the tumour to be inoperable. No definite opinion was given on a section of the specimen. On radium applications the tumour subsided but he began to get enlarged glands in the right groin which were dissected out. The culture was positive. The patient began to get growths in the chest, finally he died in December 1930. This is a doubtful case. It is reported here as the King Institute, Guindy, grew from it the same anaerobic streptococcus as they have grown in cases of lymphogranulomatosis inguinale.

Diphtheritic ulcer of foot.—Duration six months. Had a shoe-bite on the right little toe. A large bleb formed on the lateral aspect of the foot in continuation of the shoe-bite. On admission the little toe was absent. A raw red area was seen which showed no sign of healing for the last six months. Bacteriological report of the smear showed diphtheria bacilli on culture. Anti-diphtheritic serum was given and immediate improvement set in.

Mycetoma cases.—There were five cases of mycetoma of the foot. Radium was tried in three cases.

A., 30, M., H., admitted on 12th June, 1930, had a nodular swelling over the medial aspect of the foot with a number of sinuses. The swelling was movable over subjacent structures. Mycetoma granules were found on examination. The interstitial method of radium was carried out, 18,372 mgm. hours. The growth was softer and the sinuses healed up. Patient was seen again in 6 weeks and he was in good condition.

S., 40, M., H., duration 14 years. On X-ray there was necrosis of the right fourth metatarsal bone and contiguous margins of third and fifth. Radium implantation, 3,360 mgm. hours. The local condition is much improved. Patient is able to move about. He was seen recently and has two sinuses. It is difficult to say whether radium has stayed the disease.

V., 40, M., H., left foot and groin, mycetoma. There were nodules along the course of medial saphenous vein and groin glands showed mycetoma granules. Radium pad applied to groin and leg for 10 days, 50 mgms. Patient's after condition is not known.

Dr. Bainbridge described a case in 1882 where the lymphatic glands of the thigh and the groin were invaded by the particles, the disease having started in the foot. Doctors Hatch and Childe have published the case of a negro who had the knee joint affected and the inguinal glands were found to have the particles also. However on making a post-mortem examination the internal organs were found to be free from the disease. The glands surrounding the iliac vessels were considerably enlarged but no definite particles were found. The internal organs were quite free from infection. In two cases where there were glandular enlargements in the groin, no mycetoma granules were seen. This case is interesting in that there were nodules along the course of the medial saphenous vein in the leg.

Tetanus.

Admissions	..	..	..	38
Cured	..	..	..	12
Discharged otherwise	..	..	..	2
Died	..	..	..	20
Discharged moribund	..	..	..	1
Remaining	..	..	..	3

Out of the above there were visible wounds in 21 cases and no visible wounds in the rest. The mortality rate of patients with visible wounds was 9 in 21 cases, and 11 in 17 in which there was no visible wound.

Tetanus mortality has been studied and reported on in the annual report for 1922 by Lieutenant-Colonel E. W. C. Bradfield, I.M.S., and this was continued by him. All the tetanus cases are admitted under the First Surgeon by arrangement with the other Surgeons since February 1930. A vigorous purge is administered, sections from wounds and ulcers are taken, cultural examination of motions and wounds are made and the following is the result. Of the 35 cases, 32 were investigated by the Bacteriologist.

Motion culture—positive .. 3—1 died.

Amputated arm and toe.

Culture positive .. 2—2 died.

From wounds. Culture positive 2—1 died, 1 discharged otherwise.

In one case where tetanus was seen after appendicectomy, the culture result of the stools was negative.

Conservative treatment with large doses of intramuscular injection of anti-tetanic serum, chloral and bromides, and injections of 10 per cent. solution of magnesium sulphate is the usual routine.

Tetanus bacilli occur in the faeces of grooms with great frequency and occasionally they may be found in the faeces of ordinary individuals. Tembreck and Bauch found them in 35 per cent. of stools from 78 Chinese patients in Peking. On the other hand Fildes examined 200 stools in England and found only one per cent. of carriers of tetanus spores. Kerrin in Aberdeen found none in 204 stools. Although in the vast majority of cases tetanus infection is from skin wounds, it may occasionally gain access to the tissues through an operation wound involving the bowel.

Tubercular disease of the lower jaw.—There was a case of tuberculous disease in the lower jaw in an old tuberculous subject. He came in for a growth which clinically appeared malignant, but on biopsy proved to be tubercular. He then informed us that the disease began after a dental extraction. He suffered from tubercle of the lungs and genito-urinary organs.

Infective granuloma and radium.—One case of infective granuloma, in a female, aged 25, was treated with

the patient was not considered to be in good enough condition for excision. The glands were also excised and the patient was discharged from the hospital cured. One patient who was operated on 3 years ago came back to show herself and was in very good health.

Duodenal ulcer.—Chronic duodenal ulcer cases continue to come in large numbers. One hundred and twenty-one operations were done during the year with seven deaths. Of these one was from necrosis of the liver due to chloroform poisoning, one from acute dilatation of the stomach 12 days after an operation for duodenal ulcer with intussusception, one case died of hyperpyrexia and on post-mortem examination cultures of smears from the liver or spleen did not reveal any cause.

A case of gastro-colic fistula was admitted. The patient was operated on elsewhere for a duodenal ulcer 4 years ago. Symptoms were epigastric pain with no relation to food, distension after food, and faecal vomiting. He was put on a restricted diet and stomach wash daily. Since he refused an operation he was discharged from hospital.

Two cases of gastro-jejunal ulcer, both males, were seen and were operated on. It is important to insist on a careful after-treatment after operation. All sources of infection in teeth, pharynx and nasal sinuses have to be looked into. Smoking, alcohol, mental and physical fatigue and incidental infections are better avoided. A case of gastro-jejunal ulcer in which excision of the stoma and re-suturing was done in 1925 by me showed himself and is quite well.

Kidney diseases.—There were two cases of perinephric abscess which were cured. The culture of the pus showed streptococci.

A case of hypernephroma of the left kidney in a male, Hindu, of 40 years and of one year's duration, was admitted. There was a hard tumour in the left lumbar region. Nephrectomy was done and pathological examination of the tumour revealed a hypernephroma. The patient was discharged cured.

Another case of retro-peritoneal sarcoma in right kidney region in an Indian Christian, male, of 20 years, was removed by the lumbar route. The kidney was found normal, the patient was discharged cured.

Uroselectan was used in three cases.

Lieutenant-Colonel K. G. Pandalai, I.M.S., Second Surgeon, reports the following cases:—

Volvulus of the small intestine.—This condition is rare and cases of recovery from it are of interest. A Hindu male, aged 30, was admitted for pain and rigidity of the abdomen with distension of two days' duration. The history was that central abdominal pain began suddenly, followed soon after by vomiting. At the time of admission there was absolute constipation and vomiting of faecal matter. An immediate laparotomy was performed and showed in the centre of the abdominal cavity a large mass of purplish and dull-looking small intestine. In certain areas the intestine showed subserous hæmorrhages. The peritoneum contained a small amount of milky fluid. The cause of the obstruction was found to be a volvulus affecting a large part of the small intestine. Three half twists had occurred anticlockwise. The twists were undone and the abdomen closed. Subsequent progress was uneventful. The patient was discharged 25 days later in good condition.

This patient was seen again in hospital after a period of six months, complaining of abdominal discomfort and constipation. This was relieved by a purgative and the patient returned to duty as a police constable.

He is now in excellent health.

A case of wandering spleen.—Mrs. M., aged 30, was admitted for vague pains and a shifting lump in the abdomen of six years' duration. The patient lived in a malarial district and had suffered from malaria before the onset of the trouble. On examination there was a freely movable elongated tumour about the size of a fist occupying the left iliac fossa. This appeared free enough to move into the pelvis but no attachment therein could be defined. The splenic area was resonant on percussion. The tumour could be pushed up easily

under the left costal margin as well as across the middle line into any part of the right abdominal cavity.

A movable spleen was diagnosed and a laparotomy was performed. The tumour was then seen to have a long pedicle. The spleen was easily removed. All other organs were normal. The appendix was also removed at the same time. The patient made an uneventful recovery and states that she is now in excellent health.

On microscopical examination a section of the spleen showed considerable increase of the supporting tissue as well as a mono-nucleosis.

Liver abscess.—Cases of liver abscess are common in these parts, though less common than in the previous decade, probably as a result of earlier diagnosis and treatment with emetine now generally adopted by all practitioners. But it is always interesting to come across cases of liver abscess which are resistant to emetine, or have occurred in spite of emetine treatment administered for the cure of the original dysenteric trouble. One such case was that of a male, 38, Muhammadan, who was admitted for pain and swelling in the epigastrium of one month's duration. The history was that the patient had had three attacks of dysentery during the previous twelve months and at each attack he underwent a full course of treatment with emetine. Three months ago fever began and he was treated as a case of typhoid in the mofussil. On admission the swelling in the epigastrium was tense, tender and fluctuating. Temperature varied from 101°F. to 103°F. Pulse rate was 140. The patient was anæmic and the tongue was coated, bowels constipated. Motions did not contain amœbic or cysts. The Wassermann reaction was negative. X-rays showed enlargement of liver. The diagnosis of an abscess of the liver pointing in the epigastrium was followed by an incision and drainage. A pint and a half of typical liver pus escaped. The patient made an uneventful recovery and was discharged cured in four weeks. He now enjoys excellent health.

Dr. N. Mangesh Rao, Third Surgeon, reports the following cases:—

A case of Meckel's diverticulum.—A Hindu, male, aged 22 years, was admitted on 14th December, 1929, with a history of occasional attacks of pain lasting for a short time for three months previous to admission. The pain had no relation to food, nor was there any nausea or vomiting. On the 13th morning two hours after food he felt dull pain in the abdomen, it increased and towards evening became severe. Laparotomy was done on the 14th. Nothing pathological was found in the stomach, duodenum or gall-bladder. Near the terminal loop of ileum a diverticulum was found at the antimesenteric border. From the end of this a fibrous band extended to the omentum. The diverticulum and the band were excised. Patient was discharged cured. Probably this was a case of repeated attacks of partial obstruction due to the band, the last one being severe.

Hydatid cyst of liver.—A Muhammadan, male, aged 16 years, was admitted on 27th April, 1930, for a tumour in the upper abdomen of six months' duration. A large cystic tumour in the epigastrium moving with the liver during respiration with dullness continuous with that of liver. The liver was enlarged four fingers below costal arch. Leucocytic count was 7,360 per c.mm. with 12 per cent. eosinophilia.

Laparotomy.—The liver was much enlarged and congested. A large cystic tumour with thick walls arising from the under surface of the liver with the stomach below and to the left was made out. On aspiration the contents appeared purulent. After protecting the peritoneum and surrounding structures it was opened and contents evacuated. It contained collapsed daughter cysts, mostly dead. The walls being friable the cyst was marsupialized. Eleven days later the endo-cyst separated and was easily removed. Pathology report—cyst fluid contained scolices. Patient was discharged cured in due course.

A pseudo-pancreatic cyst.—A Hindu, male, aged 35 years, was admitted on 27th March, 1930, with a cystic

tumour in the upper abdomen. It started with pain and discomfort after food, followed by a slowly growing swelling of about two months' duration. On admission a cystic swelling of the size of a coconut occupied the space between the liver and stomach with the transverse colon below it. Patient complained of discomfort and distension of taking food. No history of any injury was given. Laparotomy—A cyst presented through the gastro-hepatic omentum. It was tapped and three pints of dark brown fluid was drawn. The cyst wall though thick was friable. The cyst was marsupialized. A month later patient was discharged cured. The cyst fluid contained trypsin.

Aneurysm of abdominal aorta.—A Hindu, male, aged 38 years, was admitted on 10th October, 1930, complaining of severe abdominal pain of three months' duration. It was constantly becoming worse after food but was not relieved by vomiting. He had also passed blood in his motions on several occasions. A spot a little above the umbilicus was painful, but no tumour could be made out. Urine was normal. Blood pressure was high, 170 mm. systolic and 120 mm. diastolic. Roentgenograms were negative. Patient being in severe distress an exploratory laparotomy was done. No lesions of stomach, duodenum or gall-bladder could be found. An expansile tumour of the size of an orange arising from the abdominal aorta near the origin of the coeliac axis artery was made out under the lesser omentum. Abdomen was closed. The Wassermann reaction was positive. Patient was discharged on 27th October, 1930. He was re-admitted on 25th November, 1930, complaining of continuous severe pain, very emaciated and complaining of severe breathlessness. A distinct pulsatile tumour in the right side of epigastrium could be made out and a distinct bruit heard. X-ray showed no erosion of vertebræ. Patient suddenly collapsed and died on 28th November, 1930. No post-mortem was allowed by the relatives.

A case of prolapse of mucosa of bladder.—A Hindu, male, aged 50 years, was admitted on 9th September, 1930, for prolapse of the bladder mucosa through a suprapubic fistula. Both the ureteral openings could be seen in the prolapsed mucosa. The recti had separated and retracted to some distance on either side. The previous history was that he had been operated for a vesical calculus a year previously by the suprapubic route. A plastic operation was done. The mucosa and wall of the bladder were freed from the skin and subcutaneous tissues and sutured round a Pezzer's catheter, the recti were dissected free, approximated by interrupted sutures and the anterior sheath closed by a continuous suture. After excising scar tissue, the skin flaps were sutured round the catheter. Patient did well and was discharged with a small fistula almost closed.

Resuscitation by cardiac massage.—A Hindu, female, aged 20 years, was admitted on 5th November, 1930, for suppurative mastitis. The breast was riddled with sinuses and the patient rather emaciated. During the operation on the 6th the patient stopped breathing and the heart sounds could not be made out. Intracardiac injection of adrenalin was tried without any effect. The abdomen was quickly opened and the heart felt, but it was not beating. Subdiaphragmatic cardiac massage was done and the heart began to beat and respiration started soon after. Mastectomy was done. Convalescence was uneventful and patient discharged cured on 19th December, 1930.

There follow next the reports of the special departments. Dr. P. V. Cherian, M.B., F.R.C.S.E., reports on the ear, nose and throat department. The total number of patients seen during the year was 28,484; and of operations 1,040—of which 614 were for removal of tonsils or adenoids. No less than 14 cases of rhinosporidium infection were seen, most of them coming from the Malabar coast. A large number of cases of deaf-mutism are seen every year, but examination with Hasslinger's directoscope fails to show any defect in the larynx; the condition is apparently congenital. A beginning has been made of a collection of foreign bodies removed from the nose or ear.

Dr. W. Happer, M.R.C.P.E., reports on the work of the venereal department. During the year 6,605 new cases were seen, of which 5,663 were males and 942 females. The average daily attendance is 124 males and 25 females. In-patients numbered 342 males, 194 females, and 15 children. An enormous amount of bacteriological work is involved in examining smears for gonococci, and exudate from local lesions for *Treponema pallidum*. A case of general paralysis was treated by induced malaria. Thirteen doctors were trained in the department during the year. Dr. Happer remarks on the inadequate accommodation, and the necessity for expansion.

Dr. S. Ramakrishnan reports on the work of the bacteriological department. The total number of specimens examined was 3,941 as against 3,440 in the previous year. *B. faecalis alkaligenes* was isolated on blood culture in four cases of continued fever; the pneumococcus was once isolated from a cerebrospinal fluid; and *B. coli communis* found in fluid from a knee joint. Autogenous vaccines prepared numbered 381. A commencement was made of a routine study of infected tissues and stools of all cases of tetanus for tetanus bacilli. The organism was found in 3 cases in the faeces.

The work of the Government X-ray Institute, Madras, under Captain T. W. Barnard is very well known. The temporary addition to the existing building is quite insufficient, and it is hoped that the new X-ray institute building will soon be an accomplished fact. During the year a refrigerator outfit for developing and fixing was in use and was found to be very satisfactory and meant a great saving in ice. Radiographs taken during the year numbered 19,754, whilst a great deal of radio-therapeutic and electro-therapeutic work was carried out. The total number of patients seen was 71,846, yet there is only one clerk for the whole department. One assistant surgeon and one sub-assistant surgeon were trained in the department during the year.

The following are abstracts from Captain Barnard's report:—

The following methods of visualisation of non-opaque organs by the administration of substances opaque to X-rays were carried out in the Institute:—

Barium meal.—(a) For visualising the oesophagus for growth, stricture, etc.

(b) The stomach and intestines for various conditions.

Amongst the many interesting cases from a diagnostic point of view that were examined in this way may be mentioned—

(1) A case suspected to be a tumour of the abdomen causing chronic constipation which was diagnosed to be a 'megacolon' by barium meal examination.

(2) Sodium tetraiodophenolphthalein (S. T. I. P. P.) was administered for visualising the gall bladder. A thin emulsion of bismuth carbonas given after the preliminary examination aided in determining the relation of the duodenum and hepatic flexure to the gall bladder.

The condition of the gall bladder was particularly noted in cases of sprue to verify whether there exists any relation between one type of sprue which shows lesions in the upper alimentary tract (with probably toxic absorption from the infected gall bladder) and the condition of the gall bladder as seen in the radiograph.

(3) 'Lipiodol' was used for visualising deep-seated sinuses and fistulae as well as for visualising the bronchial tree, the spinal cord, the uterus and tubes.

(4) The previous method of visualising the ureters and pelvis of the kidney by the injection of sodium iodide solution through a ureteral catheter, though even now carried out in some cases, has given place at present to the intravenous administration of uroselectan (though not with the same good results as far as diagnostic evidence is concerned).

Uroselectan is a new compound of iodine which during its excretion through the kidney and bladder permits visualisation of the pelvis of the kidney, the

ureters and bladder in addition to giving a clue as to the functional capacity of the kidneys. The reaction produced by the drug was, in our experience, to a great extent controlled by proper preparation and the hypodermic injection of 5 min. of liquor adrenaline, a quarter of an hour before administration of the intravenous injection. This method has therefore proved very safe and less troublesome to the patient than the older method in addition to the fairly satisfactory results obtained.

Amongst the radiographs of interesting cases and rare diseases may be mentioned:—

- (1) Perthe's disease,
- (2) Thomson Smith's disease of the hip joint,
- (3) Mikulicz's disease—only one case of this rare disease was seen. An Anglo-Indian boy, aged 10 years, complained of a small slightly painful swelling of two years' duration about the size of a marble on the outer end of the left eyebrow. A radiograph showed a defective shadow in the bone in that region suggestive of osteoporosis. The medical attendant was doubtful about this diagnosis and incised the swelling sending the specimen to the pathologist for report. The pathological examination showed evidence of malignancy. The boy was immediately put on radium treatment which has improved the condition considerably.
- (4) Mycetoma of the foot.

(5) A case of supposed stricture of the œsophagus was sent for barium meal administration and X-ray examination. The history was that the patient was unable to swallow. On giving a barium meal it was found that the barium was swallowed, though with difficulty, and reached the stomach. The œsophagus showed no stricture, but the lungs showed 'massive collapse' on the right side.

Another case of 'massive collapse' of the lung was noted in a patient sent for radiographic examination of the œsophagus after barium meal examination, the history of the case being that she could not swallow. The patient was not able to swallow the barium meal but the radiograph taken disclosed the condition of the lung which was probably the cause of the spasm of the œsophagus.

Both patients were old women. In the first case the patient recovered the power of deglutition two days later and a second radiograph taken showed the lung condition to have improved. The other case was lost sight of.

(6) Removal of foreign body from the eye after localisation of the foreign body by X-rays.

(7) One case of chorion-epithelioma which was sent from the Women and Children's Hospital showed secondary deposits in the lungs with extensive involvement of both lung fields.

(8) Another interesting case was of a tumour arising from the sphenomaxillary fossa pushing the eyeball forwards to such an extent that the eye appeared as if it would be expelled from the socket, and pressing the pituitary fossa from below causing considerable atrophy and changes in the region and encroaching upon the sphenoidal sinus posteriorly. It had not extended either downwards or laterally.

(9) A number of screen examinations were made for heart and lung conditions along with the barium meal cases, particular attention being paid to the pendulum movement of the contents of the middle mediastinum and its alteration corresponding to the alteration in the intrathoracic pressure due to various causes.

Two cases of phrenic paralysis unilateral in character and one of paresis of the right diaphragm were also noted during the screen examination, the last one recovering its function in about a week.

Dental radiography.—One thousand seven hundred and fifty-three radiographs were taken as against 1,602 in the previous year. The importance and usefulness, as already stated, are well recognized by both the Dentist and the Medical Officer concerned.

Thoracic examination.—Four thousand three hundred and nineteen radiographs as against 3,694 in the previous year were taken.

Examination of skull.—One thousand one hundred and fourteen radiographs were taken during the year under review as against 957 in the previous year; a large number of these patients were referred from the Government Ophthalmic Hospital, Madras.

Examination of pregnancy.—Thirty-five radiographs were taken, most of the requests for these examinations having come from the Government Hospital for Women and Children and the Government Victoria Caste and Gosha Hospital.

Diathermy and high frequency.—Six thousand six hundred and thirty applications were administered during the year under report, the conditions treated being traumatic affections, arthritis of various kinds and neuralgias. A few cases of asthma and unresolved pneumonias were also treated without any striking results. It may not be out of place to mention here the remarkable way in which cases of chronic polyarthritis of rheumatic origin (unaccompanied by osteo-arthritic changes) improved under diathermy combined with radiant heat and ionization treatment. Patients who were absolutely helpless and unable to move from side to side in bed showed remarkable progress in a few weeks' treatment; and in the course of a few months were able to move about by themselves without assistance, the movements of the joints being free and painless. Before electrical treatment was begun, drugs had been administered for a fairly long time but had made no impression on the condition. It is felt that if these cases are taken up in the early stages rapid improvement would possibly follow a few weeks' treatment in the X-Ray Institute.

High frequency fulguration appears to be the best and most rapid way of dealing with warts, especially of those affecting the face, the results being excellent as no scar is left behind. A few large warts were destroyed by diathermy under local anaesthesia, the results were good and free from cosmetic blemishes.

Surgical diathermy still holds the field in affording relief in cases of advanced malignant disease. The odorous, unsightly, bleeding masses of new growths are easily destroyed by the diathermic knife, thus rendering the last days of these patients less painful and tolerably comfortable.

Two portable mercury vapour lamps, one kromayar water cooled lamp with applicators for treatment of natural cavities and one high power radiant heat lamp were installed during the year.

Lupus vulgaris is said to be cured by ultra-violet rays alone. The treatment extends over such a long period, sometimes over a year, that few patients have the patience to go through the full treatment. One case of lupus of more than 10 years' duration which resisted treatment by X-rays for a long time rapidly improved when ultra-violet treatment was combined with X-ray exposures.

Superficial X-ray therapy.—During the year under report 1,214 treatments were administered, mostly for skin conditions.

Deep X-ray therapy.—One thousand nine hundred and eighty-nine treatments were given during the year.

The principal diseases for which X-ray treatment was given were—

- (1) Skin affections including eczema, ringworm, sycois, acne, etc.
- (2) Enlargement of lymphatic glands, chiefly tubercular.
- (3) Infective granuloma.
- (4) Tumours—malignant and non-malignant.
- (5) Diseases of the uterus, functional and organic.
- (6) Goitre—exophthalmic and adenomatous.
- (7) Early cases of tuberculosis of lung.
- (8) Tuberculosis of abdominal organs.
- (9) Constitutional diseases like rickets.
- (10) Asthma.
- (11) Rodent ulcers.

Below are short reports, received from the medical officers, on some of the important cases treated:—

Functional diseases of the uterus.—Eight cases were treated for profuse bleeding at irregular intervals. After a course of deep therapy which consisted on an average of six to eight treatments, spread over three to four weeks, patients were completely relieved of their trouble.

Organic diseases of the uterus.—*Fibroids.*—Fifteen cases were treated; with the exception of two chronic cases, these improved under the treatment; treatment on an average lasted for six weeks.

Rodent ulcers.—Six cases were treated; results were very encouraging.

Asthma.—Three cases of asthma were treated with X-rays, all of whom improved considerably.

Dysentery.—One case of dysentery was tried with X-rays after barium meal, to obtain the beneficial results from the secondary rays over the dysenteric ulcers. We understand that the treatment had a beneficial effect.

Cases of asthma are noted to react differently in different individuals, some reacting well with X-rays, others with ultra-violet radiation chiefly when combined with diathermic fomentation to the chest, subsequently to treatment with radiation. We shall be able to decide the comparative merits of treatment with various kinds of radiation when we accumulate enough statistics of such cases.

Granulomatous conditions are now being treated extensively with radiation, particularly infective granuloma. We have had comparatively good results.

In mycetoma of the foot we are extending our research in the line of treatment by deep x-ray exposure and radium and we hope to obtain sufficient record of cases at the end of next year, when the value of the treatment can be fully assessed.

More extensive use of diathermy for gonococcal infection is expected in due course.

Biological effects on the organisms concerned, in the granulomatous conditions mentioned above and in other tropical lesions are being noted by experimental measures.

Considerable co-operation of the members of the medical profession is necessary to accumulate data in this direction.

It is also hoped that a small research laboratory to facilitate research work in this direction may be arranged in the new X-Ray Institute building to be erected shortly.

Venereal bubo.—Three cases were tried this year, two cases gave excellent results after 12 exposures, the third was irregular in his attendance and subsequently was lost sight of.

Sarcoma.—One case of sarcoma of the upper jaw (an adult) gave good results after a treatment of six exposures.

Exophthalmic goitre.—Three cases of exophthalmic goitre were treated and two of them were very much benefited. The third who was an in-patient in the General Hospital was unable to attend regularly on account of another complication.

Radium.—During the year under review 117 milligrammes of radium element were added to the existing stock of radium, this making a total of 449 milligrammes of the element. This is distributed in 130 platinum-iridium or Monel metal needles or plaques.

We have been able to indent for a further supply of 105 milligrammes of radium which is expected to arrive within the next month or two. Our stock of radium will then be 554 milligrammes of the element which is represented by 1108 milligrammes of the salt, i.e., radium sulphate. Government have been pleased to allot a further sum of £1,500 for the purchase of radium during 1931.

Radium is being used in the hospitals of the city (chiefly by the Surgeons of the General Hospital, the Superintendents of the Women and Children Hospital, Government Ophthalmic Hospital and Government Victoria Caste and Gosha Hospital).

There were 906 exposures and implantations as against 763 in the previous year. The conditions for which radium treatment was given were generally for cancer of the breast, cervix, uterus, cheek, tongue, maxilla, rectum and eye. Radium was also used in several cases of sarcoma of bones. One case in particular—a young boy of 16 years with sarcoma of the foot—responded very satisfactorily to the treatment. He is under observation; the growth has not recurred after the lapse of three months. Angiomata, malignant glands, etc., were also treated with radium, as also one case of infective granuloma. It was noted that infective granuloma cases responded more readily to and gave better results with X-ray treatment than with radium treatment. In the Government Ophthalmic Hospital, in addition to a number of cases of malignant tumours, some cases of spring catarrh were treated by radium with satisfactory results.

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We have given considerable space to reviewing this report, because of its great clinical interest. Colonel Croly and his staff are to be congratulated on a report full of interest to the medical profession in India.

Correspondence

MORE ABOUT THE POPULATION PROBLEM

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—As a student of social and welfare problems and as an advocate of contraception, I was very much interested in your leader on 'More about the population problem', and in Colonel Stewart's rejoinder reprinted in the March issue of the *Indian Medical Gazette*. I think you have done a great service by calling attention to this very important question.

To begin with, let me explain the meaning of three expressions used in this connection, namely, under-population, over-population and optimum-population, as there is a lot of confusion in the minds of even those who speak glibly on the subject, as to the real significance of these phrases. The size of a population is not to be judged on the standard of national defence or industrial security, nor even on religious obligation, but there is only one criterion which is of universal application and capable of some degree of concrete measurement; this is, human happiness. Happiness is rather a wide expression and for purposes of social science, especially in matters of population, it is necessary to consider only those forms of it which rest upon material supplies, in short, on the standard of living. In the standard of living is found the final goal of all conscious social effort.

Under-population is said to exist when the population is too small under existing conditions to permit a society to raise its standard of living to the maximum level that might be possible; over-population, when the population is too great to permit of the maximum standard. These two extremes indicate that there must be in a given society at some time or other a certain size of population which represents the most favourable situation for the maintenance of the standard of living. This is the optimum-population. These terms do not indicate fixed numbers.

Under-population is a very rare and temporary situation. It has arisen only under exceptional circumstances and has never endured for long for the simple reason that its remedy lies in unrestrained multiplication. Under-population need therefore never worry a society as it will take care of itself soon enough. Over-population, on the other hand, is a very common experience. It can be safely asserted that all societies have been suffering from chronic over-population, because man has the capacity to reproduce at least four times as rapidly as is necessary to ensure survival and at least three times as fast as the available means of sustenance will permit.

In this connection we have to remember that in the life of every society four great factors of welfare are always at work. These are the land, the stage of the arts, the population and the standard of living. These all have a reciprocal relation to each other and any one may, in a sense, be considered as the product of the other three. They logically fall, however, into two sets of two factors each. Land and the stage of the arts may be considered as the sources from which man derives his material well-being. Population and the standard of living may be regarded as the objects to which he devotes the material supplies that he has been able to produce. He may enlarge his population or he may improve his standard of living. The standard of living has value for its own sake, while the size of population has no intrinsic value except by its effect on the standard of living.

It was mentioned that almost all societies suffer from chronic over-population. The acquisition of more land and the improvement in the stage of the arts have repeatedly given opportunities to establish an optimum-population. But every time such an opportunity has come the impulse to increase has forced population ahead and the chance has been lost. Just once in the entire career of mankind did there come a combination of new land and improved arts, so sudden and so sweeping that it outdistanced population and created conditions of under-population in certain parts of the Earth's surface, while raising the standard of living practically all over the globe. This was the era of the great discoveries, and of the industrial and commercial revolutions; the extraordinary population history of the 19th century was the result. During that one hundred years mankind added considerably more to its numbers than it had in all the hundreds of years that preceded.

It will thus be clear that the problem is not easy. The aim of all public health workers, social agencies and others is the same, *viz.*, to ensure the maximum amount of happiness to the people in India, in other words, to raise their standard of living and maintain it at a certain level. This can never be accomplished by sanitary measures alone but, as was mentioned, only by a simultaneous attack on the other three factors of social welfare, *viz.*, land, arts and population. Not one of these factors can be tackled alone successfully as they are interdependent on each other. The question arises where to begin? Obviously the first step is to see that the population is at least held in check, so that when the other factors improve we might be nearer the optimum-population.

You rightly suggest three or rather two alternative remedies for this—adoption of later marriages and celibacy, or the practice of contraception. Celibacy is against the Hindu religion and thus we are left with only two methods, that is to say, later marriages and the practice of contraception. These need no apology as after all the morality of any measure is dependent on the motive behind it. Reducing death rates and other public health welfare measures alone can never solve the problem. If these are taken in hand first it will be putting the cart before the horse. I agree with Colonel Stewart on the necessity for concerted action by the Government, local bodies and the people themselves, but not on the lines suggested by him. My remarks apply with more force to the rural population in India.—Yours, etc.,

CAPTAIN A. P. PILLAY, O.B.E., M.B., B.S.
(Author of 'Welfare Problems of
Rural India').

THE EUGENIC CLINIC,
QUEEN'S ROAD,
BOMBAY,
16th March, 1932.

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—As a regular reader of your journal, though not a medical man, will you permit me to make one or two observations on the editorial which appeared in your March issue with reference to the population question?

I would like to preface my remarks by saying that I am an Anglican priest, but, in view of the opinion expressed by a majority of our Bishops at the Lambeth Conference in 1930 on the subject of birth-control and of the tremendous emphasis which Christianity lays on human personality with the implication in this matter that we have no right to bring a child into the world without being able to provide it with adequate means of subsistence and development, I approach the problem with no religious or ecclesiastical bias. The point at issue is really whether the method advocated to-day in the name of science to keep down the population is scientific and achieves its purpose without landing us in other and more serious troubles. From this point of view, I submit that Lieutenant-Colonel Stewart is perfectly justified in charging you with putting the cart before the horse.

You admit that statistics are against you. I venture to assert that even biological considerations, despite Professor MacBride's contention to the contrary, will not support your case. The activity of the sexual or reproductive apparatus is governed by those endocrine glands which come under the influence of the sympathetic section of the autonomic nervous system and this in turn is brought into play by those emotions which are evoked by the perception of all those situations in life, real or imaginary, which are detrimental to the existence or welfare of the organism. In other words, the greater the dangers of life the greater is the effort which the organism makes to adaptation, growth and reproduction. An increasing death-rate implies an increasing birth-rate. The lower the organism in the scale of life the greater is its fecundity, because its chances of survival are smaller. Similarly, the primitive and less advanced races or sections of races multiply more rapidly. Furthermore, as civilisation proceeding on wrong lines makes life more difficult and dangerous for us the more will the curve of the birth-rate rise.

The conclusion to be drawn from this is obvious. If you want to control the increase of population you must remove the cause which is primarily responsible for it, that is, the shortness of the expectation of life to-day brought about by an economic system which is essentially materialistic and which ignores the rights of human personality. What you are proposing is that we should adopt the crude medical device of suppressing the disease whilst the real cause of it continues with undiminished force within. You are also conveniently turning a blind eye to the teaching of modern psychology that an instinct which is repressed works its way out in the shape of nervous and mental disease. It is, perhaps, not without significance that the age of contraceptives is also an age marked by increasing marital difficulties and psychoneuroses and insanity. Once again I submit with Colonel Stewart that you have put the cart before the horse and sacrificed truth to the demands of unconsidered modernity.—Yours, etc.,

(REV.) WILLIAM A. HOBSON,
Chaplain of Gorakhpur.

THE PARSONAGE,
3rd May, 1932.

[Note.—We are always willing to give publicity to an expression of opinion, even though it is entirely contrary to our own, but we must protest against the implication that we advocated contraceptives as the only solution to the problem.—EDITOR, I. M. G.]

THE TREATMENT OF HYDROPHOBIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I should like to draw attention to possibilities in the treatment of hydrophobia by the combination of 'phylaxis' produced by chloroform, etc., with an antirabic serum. A résumé on 'phylaxis' was recently written by Cruchet in the *British Medical Journal* (January 16th, 1932, p. 86). Success seems to have been obtained by Billard in promoting the action of antitetanic serum by giving chloroform. The idea of the action of such phylactic agents is that they weaken the

hold of toxins on the lipoids of nerve cells and thus facilitate the combination of these toxins with the anti-toxins of the serum. Though in rabies we are probably not dealing with toxins apart from the living virus, yet since successful anti-virus sera can be produced against several viruses there is no reason why an anti-rabic serum should not be produced which will successfully act on rabies virus, that is, when the latter is free to be acted on. Within nerve cells it is probably not free to be acted on, but may it not be made sufficiently free by the action of phylactic agents? As I do not think I ought to introduce rabies virus into an institute that manufactures vaccine lymph, I am not in a position to work out this idea myself, and so leave it to others.—Yours, etc.,

H. H. KING,

LIEUTENANT-COLONEL, I.M.S.,
Director, King Institute.

GUINDY,
31st March, 1932.

HABITUAL FORMATION OF STONE IN THE BLADDER

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In your last December number Dr. J. F. Henriques cites a case of recurrent vesical calculus of his own, and refers to a note of Dr. G. R. Tambe in the September number and to a case that was reported in the *Lancet* five or six years ago.

In a patient of mine the vesical calculus was of the size of a big-size coconut. Litholapaxy not being possible, I performed the supra-pubic operation and extracted it. The long wound took time to heal, but the patient was discharged with a quite healthy bladder.

Six years later, he returned with almost all his previous symptoms. There was, however, no calculus in the bladder. I could see on cystoscopy that there were deposits on the old cicatrices. The symptoms were allayed with difficulty.

Dr. Henriques reports that in the *Lancet* case the surgeon advocated saccharine tablets which are said to have given complete relief. I should like to know what could be the rationale of saccharine in calculus.—Yours, etc.,

V. S. UMACHIGI, L.M. & S.

BELGAUM,
24th March, 1932.

Service Notes

APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL C. HUDSON, C.B., C.I.E., D.S.O., R.H.S., I.M.S., D.D.M.S., Eastern Command, to be Officiating Director of Medical Services in India, *vice* Major-General W. H. S. Nickerson, V.C., C.B., C.M.G., R.H.S., Brit. ser., proceeded on leave. Dated 1st April, 1932.

Brevet-Colonel H. H. Thorburn, C.I.E., an Agency Surgeon, on return from leave, is posted as Residency Surgeon and Chief Medical Officer in Baluchistan, with effect from the 16th March, 1932.

In consequence of the grant of leave to Colonel H. M. Mackenzie, V.H.S., Lieutenant-Colonel C. A. Gill, Director of Public Health, Punjab, is appointed to officiate as Inspector-General of Civil Hospitals, Punjab, in addition to his own duties, with effect from the 28th March, 1932, and until further orders.

Lieutenant-Colonel F. Stevenson, an Agency Surgeon, on return from leave is posted as Residency Surgeon in Kashmir, with effect from the 5th April, 1932.

Major N. C. Kapur, Civil Surgeon, Chittagong, is appointed as Civil Surgeon, Howrah, *vice* Lieutenant-Colonel K. S. Thakur.

Major T. H. Thomas, on return from leave, is appointed as Civil Surgeon, Mymensingh, with effect

from the 16th April, 1932, or any date on which he takes over charge, *vice* Major S. J. V. Fox.

The services of Major N. B. Mehta are placed temporarily at the disposal of the Government of Bombay for employment in the Jails Department, with effect from the afternoon of the 7th April, 1932.

Major H. H. Elliot, M.B.E., M.C., is appointed substantively to be an Agency Surgeon under the Government of India in the Foreign and Political Department, with effect from the 23rd April, 1932.

The services of the undermentioned officers of the Indian Medical Service are placed temporarily at the disposal of the Local Governments specified below, with effect from the dates mentioned:—

Government of Madras

Major A. I. Cox, 1st February, 1932 (afternoon).

Captain J. A. W. Ebdon, 31st January, 1932 (afternoon).

Government of the United Provinces

Captain A. J. C. Culhane, 27th January, 1932.

Captain W. Aitchison, M.C., 1st February, 1932.

Captain C. V. Falvey, 26th January, 1932.

Government of Burma

Major J. H. Barrett, 18th December, 1931.

Captain R. McRobert, 29th January, 1932.

Major P. A. C. Davenport, 22nd February, 1932.

Government of Bihar and Orissa

Major A. V. Lopes, 17th December, 1931.

Major H. M. Strickland, 23rd January, 1932 (afternoon).

Captain F. H. Whyte, F.R.C.S.I., 21st January, 1932 (afternoon).

Government of Bengal

Captain J. C. Drummond, F.R.C.S., 15th February, 1932.

Government of Central Provinces

Major J. Carrey, 23rd March, 1932 (afternoon).

Captain W. Scott, 11th February, 1932.

Government of Assam

Captain R. A. Haythornthwaite, 19th February, 1932.

Captain R. Linton, whose services have been placed at the disposal of the Bengal Government by the Government of India, is appointed as Civil Surgeon, Chittagong, *vice* Major N. C. Kapur.

The services of Captain D. Kelly are placed temporarily at the disposal of the Government of the Central Provinces, with effect from the 10th April, 1932.

On reversion from foreign service under the Indian Research Fund Association, Captain H. W. Mulligan, an officer of the Medical Research Department, is appointed to officiate as Assistant Director, Central Research Institute, Kasauli, with effect from the 6th April, 1932, or subsequent date from which he assumes charge of his duties, *vice* Captain M. L. Ahuja, on deputation to attend the Senior Officers' Course at Millbank.

LEAVE

Colonel P. L. O'Neill, C.I.E., Inspector-General of Civil Hospitals, Burma, is granted leave preparatory to retirement, on average pay for 6 months and 19 days combined with leave on half average pay for 19 days, with effect from the 21st July, 1932.

Lieutenant-Colonel W. L. Harnett, Professor of Surgery, Medical College, Calcutta, is granted leave for 6 months, with effect from the 9th March, 1932.

This cancels previous notification.

Lieutenant-Colonel A. Denham White, Civil Surgeon, 24-Parganas, is granted leave on average pay for four and a half months, with effect from the 28th April, 1932, or the date of availing.

This cancels previous notification.

Lieutenant-Colonel A. N. Dickson, M.C., an Agency Surgeon, is granted leave preparatory to retirement for 4 months and 13 days on average pay combined with leave on half average pay for 1 year, 6 months and 24 days, with effect from the 16th March, 1932.

Lieutenant-Colonel E. S. Phipson, D.S.O., Civil Administrative Medical Officer, Aden, and Port Health Officer, and Medical Officer, European General Hospital,

Aden, is granted leave on average pay for 6 months followed by leave on half average pay for 18 days, with effect from 6th April, 1932, or subsequent date of availing.

PROMOTIONS

Captains (provl.) (on probation) to be Captains (on probation)

R. R. Bakhshi.
D. C. Chopra.
M. Jafar.

Lieutenants to be Captains (provl.)
H. J. Curran. Dated 4th February, 1932.
A. M. Fraser. Dated 4th February, 1932.

RESIGNATIONS

Captain J. N. Madan. Dated 29th March, 1932.
Captain C. V. Ranchandani (temporary Commission). Dated 21st March, 1932.

RETIREMENTS

Brevet-Colonel F. P. Mackie, O.B.E., K.H.S. Dated 19th February, 1932.
Lieutenant-Colonel C. H. Barber, D.S.O. Dated 10th March, 1932.
Lieutenant-Colonel A. H. Napier. Dated 18th March, 1932.

Notes

AN ANÆSTHETIC MASK FOR OPHTHALMIC USE

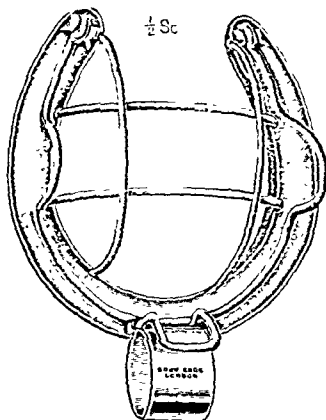
By R. BURNS, M.B.

*Durham County and Sunderland Eye Infirmary
Sunderland*

The mask consists of a hemispherical wire dome on a horse-shoe shaped gutter. There is no wire at the nasal end.

In practice, any mask which straddles the nose is in the surgeon's way, particularly during operations in the lower lid and lachrymal sac regions. The mask invariably gets pushed off the nose, allowing too great an air leak.

This mask rests just at the end of the nose. The gap between the ends of the horse-shoe gutter is bridged



by the lint, which is intended to be worked up with the finger into a hood. This hood covers closely the lowest half inch or so of the nose, and can be accommodated to any average-sized nose by merely working up with the finger, or pulling on the lint at the sides.

The mouth and nostrils are thus closely covered, while the mask is as far away from the operator as possible.

Additional points are:—

(1) Loops in the clamping wire, at the sides, to allow of the passage under the lint of a tube from the oxygen cylinder or Junker's bottle. The idea is that of Shipway's mask, but the soldered-in metal tubes

were not thought necessary, as a medium-sized rubber tube is clamped quite tightly enough to prevent accidental falling away.

(2) A ring handle, modified from Dunderdale's, is fixed to the chin end of the gutter.

The makers are Messrs. Down Bros., Ltd., London, to whom I am indebted for practical advice and the taking of much care and trouble.

SURGICAL DIATHERMY

A RECENTLY issued brochure entitled 'Surgical Diathermy' by Messrs. Watson and Sons (Electro-Medical), Ltd., is their Bulletin No. D 2. This will be of interest, not only to the surgeon and specialist, but also to the general practitioner, as it briefly outlines the evolution, methods, uses and advantages of surgical diathermy in an interesting manner. The chief advantages claimed for surgical diathermy are reduction of hemorrhage, elimination of the risk of metastasis, reduction of trauma, post-operative pain and surgical shock, shortening of the operative time, and increase in the speed of healing. The scope of surgical diathermy is now an ever-widening one, and it is being freely used in abdominal surgery and even in intracranial surgery.

After many years of investigation in collaboration with leading British surgeons, Messrs. Watson and Sons have produced a final apparatus—the 'Chirotherm', whose value has been proved in the hands of many well-known surgeons. In this the thermionic valve is used in preference to the tungsten spark gap. The electrical equipment is entirely enclosed and does not require any adjustment by the operator, the thermionic valve is mounted inside the cabinet and is therefore adequately protected, the control panel has the controls conveniently situated, and the apparatus is complete with cables and set of electrodes. The 'Chirotherm' is intended for use with the alternating current, and for use with the direct current a rotary converter must be fitted.

The bulletin includes a useful bibliography of books and articles on surgical diathermy which have appeared during the last two or three years. The complete 'Chirotherm' apparatus is priced at £250, with a rotary converter at £37-10-0; whilst a portable model is also described at £150, with a rotary converter at £25, and a standard set of cables, electrodes and electrode holders at £10-10-0.

Those interested in surgical diathermy and its possibilities would do well to write for a copy of this brochure to Messrs. Watson and Sons (Electro-Medical), Ltd., Commerce House, Currimbhoy Road, Ballard Estate, Bombay.

'BISOXYL', B. D. H.'

A RECENTLY published little brochure deals with 'Bisoxyl', prepared by the British Drug Houses, Ltd., and indeed with bismuth therapy in syphilis in general. The advantages of bismuth therapy over the older forms of treatment are its efficacy combined with its freedom from toxicity. It cannot be claimed that bismuth therapy should be adopted to the exclusion of all other forms of treatment, but bismuth has been described as 'the drug of election for the treatment of syphilis, giving as good or better results than arsenic, with far less risk'. The mode of action of bismuth is probably an indirect one, on its administration protein-bismuth compounds are presumably formed in the body which have a spirochæticidal action.

Bismuth is rapidly absorbed and slowly eliminated; hence it is essential to use only reliable and standardized preparations. The best results are obtained when a suspension of an insoluble or sparingly soluble bismuth salt is employed. The oxychloride is the salt which possesses the qualities of absolute purity and stability, and, when in a finely-divided state, injections of this compound are found to be practically painless and extremely potent.

It is claimed that in 'Bisoxyl, B. D. H.' bismuth oxychloride is exhibited in ideal form; each 1 c.cm. contains 0.1 gramme of bismuth oxychloride and 0.005 gramme of chloretone, which serves as an analgesic and preservative. In the preparation of Bisoxyl special attention is given to the physico-chemical requirements, and the product is uniformly and regularly absorbed. Further, investigations at St. Thomas' Hospital have shown that the preparation is especially valuable in cases of congenital syphilis and *lues tarda*, a type of case which is apt to be very refractory to other forms of treatment.

The injections should be given intramuscularly, as subcutaneous injections may be painful and intravenous ones not free from risk. An identical scheme of treatment does not necessarily suit all patients, but in general it may be stated that the average daily dose of bismuth oxychloride should be equivalent to 0.6 mgm. per kilogram of body weight.

Bisoxyl may be administered alone or in conjunction with salvarsan or neosalvarsan. In the combined treatment five or six weekly injections of from 0.6 to 0.75 gm. may be given alternately with a series of eight to ten injections of Bisoxyl in doses of 1.5 to 2 c.cm. A complete course should extend over about two years, and comprise approximately 18 injections of neosalvarsan and 60 of Bisoxyl. When administered alone, a dose of 2 to 3 c.cm. of Bisoxyl may be injected two or three times a week. It is claimed that children tolerate Bisoxyl very well, and may be given 0.2 c.cm. per week for every six months of age, a course of six to twelve injections.

Bisoxyl is issued in boxes of ampoules of 1 c.cm., 2 c.cm., 3 c.cm., and 5 c.cm., and also in rubber-capped vaccine bottles of 30 c.cm.

UROSELECTAN-B

THE introduction of Uroselectan in 1929 by Swick, who had worked under Professor Lichtenberg of Berlin, marked a notable advance in renal medicine and surgery and in radiology. We have recently published several abstracts from papers dealing with this subject in our 'current topics' columns, and our readers must be familiar with it. Uroselectan has proved very successful in rendering the pelvis of the kidney and the ureter visible under X-ray examination, but it suffers from the disadvantage that it has to be dissolved before use, and care is needed in the preparation of the solution. Professor Lichtenberg has recently introduced a new organic iodine compound—Uroselectan-B—which is claimed to be water-soluble and stable in solution. It is put up in ampoules of 20 c.cm., which contain 15 grammes of the compound dissolved in a 10 per cent. solution of invert sugar. The ampoules are warmed to body temperature and the contents injected intravenously very slowly. The excretion of the drug commences immediately, and it is claimed that in many cases a pyelogram can be obtained in a few minutes. Care must be exercised in using the drug in patients with severely impaired liver function or with uræmia.

The introduction of this compound appears to be an important advance in the simplification of the technique of pyelography.

Information and literature concerning Uroselectan-B may be obtained from Messrs. Schering-Kahlbaum (India), Ltd., P. O. Box 2006, 4, Dalhousie Square, East, Calcutta.

WATSONS' MICROSCOPE RECORD

WE have frequently drawn attention to this admirably run little journal, which is full of useful information and 'tips' for microscopists and laboratory workers. It is issued free on application to Messrs. W. Watson and Sons, Ltd., 313, High Holborn, London, W.C. 1.

The issue for January 1932, recently to hand, contains an article by H. Ellis, F.R.M.S., on fibre microscopy, and the appearance of fibres of different materials under the microscope, a matter often of medico-legal importance. Mr. F. J. Brislee, F.I.C., F.R.M.S., describes

the use of Hydrax as a mountant for diatoms, in preference to the use of Canada balsam and styrax. E. W. Newmarch contributes notes on the freshwater polyzoa, and D. S. Spence, M.B., discusses the always difficult question of permanent fluid mounts. In the Notes section focussing a 1/12th inch oil immersion lens is discussed.

PILL ALOPHEN, PARKE, DAVIS & CO.

PILL ALOPHEN, Parke, Davis & Co., is designed as a pill for regular use in cases of constipation. Its composition is as follows:—

R Aloin	..	..	gr. 1/4
Phenolphthalein	..	..	gr. 1/2
Ipecacuanha	..	..	gr. 1/15
Strychnine	..	..	gr. 1/80
Extract of belladonna	..	..	gr. 1/12
			per pill.

This combination may be characterised as an active laxative. The aloin used is a specially pure crystalline product that can be relied upon. The action of the aloin is reinforced by the inclusion of phenolphthalein, whose action rather resembles that of the saline cathartics. The ipecacuanha should stimulate hepatic function, and the strychnine counteracts atony of the lower bowel, whilst the belladonna exerts a sedative influence and prevents griping.

The ordinary dose is two pills at bedtime, or, in cases of obstinate constipation one pill every 4 or 5 hours, the number of doses being gradually reduced when sufficient effect has been obtained.

The address of the Indian branch of Messrs. Parke, Davis & Co. is Lloyd Building, Ballard Estate, P. O. Box 88, Bombay.

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Communications for the Publishers relating to Subscriptions and Advertisements should be addressed to THE PUBLISHERS, *The Indian Medical Gazette*, P. O. Box No. 54, Calcutta.

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Original Articles

THYMOL, MENTHOL AND CAMPHOR FROM INDIAN SOURCES

By R. N. CHOPRA, M.A., M.D. (Cantab.)
LIEUTENANT-COLONEL, I.M.S.

and

B. MUKHERJEE, M.B. (Cal.)

Indigenous Drugs Enquiry, I. R. F. A., Series No. 35

(From the Department of Pharmacology, School of Tropical Medicine, Calcutta)

THYMOL, menthol and camphor are well known in the materia medica of western medicine as well as in that of the indigenous medicine in India. Thymol has been considered important on account of its powerful antiseptic, germicidal and anthelmintic properties. One of its chief uses in recent years has been in the treatment of hookworm disease. It is also largely used as a constituent of tooth-pastes and mouth-washes and as a skin disinfectant in dermatological practice. Menthol is extensively employed in liniments, spraying lotions and in dental practice. Camphor is one of the commonest remedies and is used in almost every household in India for a variety of purposes. The huge demand for these stearoptenes can, therefore, be easily understood. Large quantities of these drugs are imported from foreign countries. It will, therefore, be interesting to examine the indigenous sources from which these drugs can be produced and the possibilities of their manufacture in India on a commercial scale.

Thymol

It is well known that thymol is contained in a number of essential oils occurring in many plants distributed all over the world. The most important source is the Spanish thyme, *Thymus vulgaris* or *Thymus zygis*, a small, evergreen shrub belonging to the Labiatae family. It is indigenous in Spain, Portugal, France and Italy and is also extensively cultivated in other parts of Europe and America, especially in Germany and in New York State. Thymol also occurs in varying proportions in oils from *Monarda punctata* (American horse-mint), *Carum copticum* (Indian ajowan), *Ocimum viride* (the mosquito plant of West Africa), *Ocimum gratissimum* (Seychelles), *Cunila mariana* (North America), *Mosla japonica* (Japan), etc. The chief source from which thymol can be produced in India is *Carum copticum*. The seeds of this plant, known as 'ajowan' seeds, have been used in the indigenous medicine in the treatment of atonic dyspepsia, diarrhoea, colic, flatulence, indigestion and cholera. The aromatic seeds are extensively used as a condiment in curries, to flavour

sweetmeats, in 'pan supari' (betel leaf) mixtures, etc. The ajowan plant has, therefore, been grown to a greater or lesser extent all over India. It is particularly abundant in Bengal, Central India (Indore) and Hyderabad (Deccan). Nearly 7,000 to 8,000 acres of land are under cultivation each year in the Nizam's Dominions alone and similar large areas are also stated to be under cultivation in the Punjab and the United Provinces. Large quantities also find their way into India through the inland routes from Afghanistan, Baluchistan and Persia. It can in fact be grown in any part of the Indian Peninsula and the country has possibilities of being a rich source of raw material for the production of thymol. Indeed this source has already been exploited by the foreign manufacturers as will be seen from the quantities of seeds exported from India between 1911 and 1918 :—

	Total quantity exported in cwt.	Value of the seed exported in £ sterling.
1911-12 ..	15,515	4,583
1912-13 ..	21,650	6,135
1913-14 ..	9,784	2,983
1914-15 ..	7,368	2,736
1915-16 ..	13,062	4,871
1916-17 ..	11,093	4,304
1917-18 ..	3,990	2,765
1918-19 ..	1,917	2,102

Besides this, *Cuminum cyminum* may also serve as a subsidiary source of thymol. *Cuminum cyminum* is abundantly cultivated all over India, particularly in the United Provinces and the Punjab as a field or garden crop and is exported in large quantities to Ceylon, the Straits Settlements and British East Africa. It contains 3 to 3.5 per cent. of cumin oil whose chief constituent is cumic or cuminic aldehyde which can be converted artificially into thymol.

Thymol from Carum copticum.—It is common knowledge that 'ajowan' seeds have been distilled in India by crude methods for centuries and the impure thymol produced, known as 'ajowan-ka-phul', has been used in the indigenous medicine. The seeds distilled with water produce 'ajowan-ka-arak' which is well known as a medicine to the people. It was, however, only as a result of the cutting off of foreign supplies of thymol during the war, and the stoppage of the export of seeds from India later, that definite attempts were made to manufacture the article on a commercial scale.

Ajowan seeds from various sources in India have been examined for their oil contents. The seeds from different parts of the country yielded varying proportions of oil ranging from 2.0 to 3.5 per cent. Seeds obtained from the Kurnool-Guntakal district of Madras Presidency appeared to be the best variety obtainable in India. These seeds were thicker than the ordinary seeds and were of a yellow colour and gave a high yield of oil, i.e., 3.5 per cent. The

seeds obtained from Northern India yielded only 2.07 per cent. of the oil, and the percentage of thymol in most of the Indian oils is not more than 33 to 37 per cent. This is low as compared with the yield obtained from the Spanish thyme which is the chief competitor of the 'ajowan' seeds. Besides this, *Carum copticum* grown in other parts of the world appears to give a larger yield of oil. A sample of seeds from the Seychelles gave on analysis 9 per cent. and from Montserrat 3.1 per cent. of oil, containing 39 and 54 per cent. of thymol respectively.

It would appear from this that the production of thymol from raw materials at present available in India would not be commercially a successful proposition. Experiments conducted in Hyderabad by the Department of Industries and Commerce of the Nizam's Government showed that the maximum yield of the oil was not more than 2 per cent. of the weight of the seeds and the yield of thymol crystals not more than 36.97 per cent. of the weight of the oil. With these results it does not appear to be likely that the manufacture, on a commercial scale, of thymol will be successful. Manufacture of the drug was actually taken up by the Gwalior and the Dhar States. The figures for yield of the oil and thymol on a large scale in Gwalior State are given in the following table :—

Quantity of fruit in lbs.	Yield of oil in lbs.	Yield of crude thymol in lbs.
26,076	742.5	321.2
22,227	652.5	269.1
32,380	943.7	370.5

A perusal of the table will show that the yield of crude thymol is not very high. The manufacture in Dhar State appears not to have been a commercial success and has been discontinued.

Commercial aspects of thymol production.—Previous to 1914 thymol was chiefly produced from natural sources. With the discovery of cheap methods of synthesis large quantities of the drug are being synthesised. Several methods have been devised in Germany, America and England for manufacturing the article from crude phenols. Metacresol from which thymol can be manufactured is a very cheap product and consequently synthetic thymol has been offered at a very low price. Besides this, the ketone, 'piperitone', a substance which can be produced in large quantities and at a low cost from the Australian eucalyptus, can also be readily converted into thymol.

With the advent of synthetic thymol the natural product is being completely displaced. Even in Spain, cultivation of thyme is gradually being looked on with disfavour and small farmers in many localities have discontinued its cultivation. The prospects of thymol production from the Indian ajowan seeds are not, therefore, bright at present. Large quantities

of the seeds, however, are grown in India and as the export is completely stopped they will have to be utilised or the cultivation will cease. Some workers have shown that thymol manufacture in India should not be a failure if the by-products, e.g., spent seeds, omum water, thymene oil, etc., could be utilised. The spent seeds contain 15 to 17 per cent. of protein and 25 to 32 per cent. of fat and can easily replace ordinary oil-cakes in the fodder of cattle. The omum water is already in extensive use as a carminative, stomachic and stimulant. Thymene oil can be utilised in scenting cheap soaps though it is never likely to be in great demand for such a purpose. Moreover better methods of cultivation are likely to improve the yield of the oil. If this is done it is possible that with cheap labour and other factors present in this country, the production of thymol from distillation of ajowan seeds could be made economically successful. In addition to ajowan seeds, it will probably be worth while considering the possibility of manufacture of thymol from the ketone, piperitone, in this country. Eucalyptus trees grow very well in many parts of India and eucalyptus oil is already being produced on a commercial scale. Large tracts of country are available for cultivation of eucalyptus, and piperitone could be produced on a large scale. Its conversion into thymol ought not to involve a large outlay of capital. The whole question of manufacture needs careful study by experts but, from the data we have at our disposal, the position appears to be hopeful.

Menthol

Menthol is obtained chiefly from *Mentha piperita* or the marsh mint which grows extensively in the British Isles and in the United States of America. Though *M. piperita* does not grow in India, a number of other species of mentha grow quite well. Examples of these are *Mentha viridis* (spearmint), *M. incana* (peppermint), *M. sativa*, *M. aquatica* and *M. arvensis*. All these varieties, excepting *M. arvensis*, occur as garden plants and are sparingly distributed at present. *M. arvensis* grows very abundantly in the northern and western Himalayas in a state of nature. It is found in Kashmir at an altitude of 5,000 to 10,000 feet. The drug does not appear to have attracted the attention of the ancient Hindu physicians though it is now extensively used as a household remedy throughout India for its stimulant and carminative properties. Mint is also largely used in flavouring foods.

In view of the abundance and the easy availability of *M. arvensis* in India, experiments were conducted at the Calcutta School of Tropical Medicine to see how the essential oil derived from *M. arvensis* compares with the peppermint oil of commerce. The essential oil obtained on steam distillation of the herb from

Kashmir was found to have the same odour, taste and other physical characters as the peppermint oil used in the British Pharmacopœia, and crystals of menthol could be easily obtained from it on keeping for some time. The yield of oil was 0.18 to 0.2 per cent. which may be considered quite satisfactory when compared with some of the specimens of peppermint grown under ideal conditions in some of the experimental farms in America.

Place	Yield of oil
Arlington farm (America) ..	0.12—0.13 per cent.
Webster, South Dakota (America)	0.10 "
Glendale (America) ..	0.11 "

It is likely that if distillation is carried on with specimens of fresh herb, a higher percentage of the oil may be obtained than that from the dry herb collected in Kashmir and examined by Chopra and others (1929). It has been stated by competent authorities that drying of the herb before distillation results in a loss of 50 per cent. of the oil.

As a result of extensive researches carried out by the United States Department of Agriculture, it has also been found that if the leaves are collected during the budding and flowering stages, the yield of the oil on distillation is much higher than the figures given above. The following table shows some of the results obtained by the American workers :—

Stage	From entire plant, per cent.	From leaves alone, per cent.	From the tops, per cent.
Budding ..	0.116	0.203	0.173
Flowering ..	0.113	0.303	0.233
Fruiting ..	0.133	0.120	0.153

It is, therefore, quite likely that if similar precautions are taken with regard to the Indian plant, the yield of oil will be still further improved.

Menthol from Indian sources.—Apart from the natural sources already existing, *M. piperita*, the most important official source of the drug, can be grown as a garden plant in India. Any marshy soil situated along the banks of rivers, provided it is well drained and not too damp, is suitable. According to a recent report by the Ministry of Agriculture, London, any light calcareous soil, friable sandy loams or gravels may be used for cultivation of mint and only the usual attention given to such crops as corn, potatoes, etc., need be given. Soil of the above description is available in many parts of India. Many years ago, successful experiments were carried out in growing the plant in the Nilgiri Hills and good peppermint oil was actually produced for the Medical Stores Department of the Government of India. Not only was the quality of the oil good but the price compared favourably with the imported oil. There is,

therefore, no reason why this industry should not be successfully developed. The methods of planting, cultivating, harvesting and distilling have been worked out through years of trial and experiment in many countries and could be easily taken advantage of in India.

M. arvensis grows luxuriantly in a state of nature in the forests of the northern Himalayas (Kashmir). If the Forest Department concentrate their attention on these areas, protect them from grazing and encourage its growth, large quantities of the raw material for the distillation of the oil could be made available at a small cost. Cultivation of *M. arvensis* in suitable areas could also be carried out on a commercial scale without difficulty and without much expense, as has been done by the Kashmir Government in the case of *S. lappa* (Kuth root).

Economic aspects.—Peppermint oil of commerce is derived chiefly from two botanical sources :—(1) The English, European and American oil from *M. piperita* and its varieties *officinalis* and *vulgaris*, and (2) the Japanese oil from *M. arvensis* and *M. canadensis*. English peppermint oil is said to be superior to other kinds of oil on the market and commands a much higher price and consequently a good deal of adulteration of the English with the American oils takes place. The Japanese oil differs from the English and American oils in possessing a strong characteristic odour and a somewhat pungent taste. It is rich in menthol content and readily crystallises to an almost solid mass on cooling. As the oil is not yet made official in the British or the United States Pharmacopœias, it cannot be used extensively in medicine, but it is probable that it will be recognised and accepted in the near future. In spite of this it is being largely used for various purposes as will appear from the total export figures from Japan in 1926 :—

Peppermint oil ..	637,203 lbs.
Menthol ..	705,371 "
Menthol pencils ..	176,668 "

At present, the main supply of the oil comes from Japan which supplies about 80 per cent. of the world's requirements. Next to Japan, America is the largest producer of mint oil. The cultivation of peppermint in the United States began as early as 1816 and is zealously carried on to this day. The plant is scientifically cultivated mostly along the Pacific coast and a distinct progress in the rate of production of oil is evident within the last 15 years. Thus in 1914, the annual production stood at 250,000 lbs. of oil, whereas in 1926 nearly 600,000 lbs. of oil were distilled. America not only supplies her own somewhat extensive needs but also carries on a huge export trade in the oil. This may be estimated from a study of the export of peppermint oil from the United

States which in 1923 was 102,507 lbs., in 1924 was 159,729 lbs. and in 1925 was 127,218 lbs.

Both Japan and the United States derive a large profit from the sale of peppermint oil and menthol. England, France, Italy and Germany also possess flourishing industries in mint oil. Australia recently has been experimenting somewhat extensively in the production of oil of peppermint and the published reports indicate very favourable results. Within the last few years, cultivation of peppermint has been taken up in Roumania on an experimental scale and it is said that the experiment has succeeded remarkably. In view of the large natural resources existing in India and in view of the fact that the average price for peppermint oil is steadily on the increase, it may be worth while for this country to develop this industry.

Synthetic menthol.—The possibility of competition of the natural article with the synthetic menthol now placed in the market should not, however, be lost sight of. Menthol can be easily synthesised by reducing ketones such as menthone, pulegone and piperitone. Piperitone is contained in eucalyptus oil and to a certain extent in the dementholised oil produced in Japan and can be easily converted into menthone which, in its turn, can be changed by catalytic hydrogenation into menthol. Pulegone is the principal ingredient of pennyroyal oil (*Mentha pulegium*) and will be found to a noticeable degree in the Japanese peppermint herb. Like piperitone, this can be changed into menthone. Citronellal occurs in large quantities in citronella oil obtained from citronella grass (*Cymbopogon nardus* of Java and Ceylon) and can also be used in the preparation of menthol. These materials are available at a very low price and, therefore, synthetic menthol can be sold in the market at a rate which leaves very little profit for the mint growers.

Synthetic menthol sold in India has been examined in the chemical department of the Calcutta School of Tropical Medicine. In appearance and odour the synthetic product is very similar to the natural menthol. It has a melting point of 35°C. and is lævo-rotatory. Tests have further shown that the synthetic product is slightly more active physiologically but less toxic than the natural product. As matters stand at present, it is not possible to forecast the possibilities of the natural menthol industry. The rate at which the synthetic article is being produced and boomed in the market augurs very unfavourably for the natural product. For her internal needs, however, India could easily utilise her large natural resources.

Camphor

Camphor from Indian sources.—Unlike thymol and menthol, India's natural resources for producing camphor are rather poor.

Cinnamomum camphora, the important camphor-yielding tree, does not grow in India. Several varieties of *Blumea*, e.g., *B. balsamifera*, *B. lacera*, *B. densiflora*, *B. malcomii*, *B. grandis*, etc., capable of yielding a fairly good quality of camphor, however, grow luxuriantly in the Himalayas from Nepal to Sikkim as well as in the western part of the Deccan plateau at an altitude of 1,700 to 2,500 feet. *B. balsamifera* and *B. densiflora* are the two varieties which deserve special mention. *B. densiflora* is a small bushy plant found in various parts of Assam, the Khasia hills, Chittagong, and other places. *B. balsamifera* grows abundantly in Burma and according to Mason this plant is so abundant that Burma might supply half the world with camphor. Wherever trees are cut down, this weed springs up and often to the exclusion of almost everything else. Dymock drew attention to another camphoraceous *Blumea* commonly growing near Bombay and used by the people. In addition to the species of *Blumea*, there are many other plants in India which smell strongly of camphor, some of which would probably yield camphor. The common aquatic weed of the plains of Bengal, *Limnophila gratioloides*, the *Karpur* of the Bengalis, is an example.

In the latter part of the 19th century, efforts were first made to grow camphor-yielding plants in India. The camphor trees of Borneo and Sumatra, from which 'Baros' or 'Barus' camphor is derived, and a number of other plants belonging to the natural order *Dipterocarpeæ* were first tried. In the report of the Lucknow Horticultural Gardens for 1882-83, it is mentioned that camphoraceous trees which were being cultivated there had done well. Gradually, however, the cultivation of these camphor-bearing trees was discontinued and attention was directed towards the most prolific camphor tree of Japan and Formosa, the *Cinnamomum camphora*. These trees were later on grown successfully in a number of localities in India. At one time they are said to have flourished in Nepal and Tipperah, between Bengal and the Upper Irrawady. In Ceylon the tree grows well at elevations of 5,000 feet and less. There is a fine avenue of trees in Dehra Dun and in the Botanic gardens at Calcutta and Saharanpur. Experimental cultivation in the Nilgiris has shown that the trees do well even up to 7,000 feet above the sea level. *C. camphora* has been grown in many parts of Burma particularly in the Maymyo and Bhamo districts. In the Southern Shan States, notably at Lawksawk, a plantation of 650 acres still exists at an altitude of 3,500 feet.

Camphor content of the camphor tree grown in India.—The proportion of camphor and other constituents found in the trees depends upon the climatic conditions and locality to a very large extent as will be seen from the fact that camphor trees grown in Mauritius and known

to be the genuine variety do not yield camphor at all. The trees growing in India fortunately are much better and yield fairly large proportions of camphor, though not to the same extent as is found in trees growing in Formosa and Japan. This will be appreciated from a comparison of the following tables showing the oil content of the Indian tree with the Japanese tree :—

Oil and camphor content of different parts of the Indian camphor tree

Place of growth	Description of material	Total volatile oil yield, per cent.	Camphor, per cent.	Camphor oil, per cent.
Nilgiris ..	Green leaves.	1.0	0.1—0.7	0.9—0.3
Madras ..	Do.	2.62	1.99	0.63
Burma ..	Do.	1.51	1.03	0.48
Cochin ..	Do.	2.33	2.01	0.32
Dehra Dun	Do.	4.04	0.38	3.66
Dehra Dun	Young leaves.	4.83	0.59	4.24
Dehra Dun	Twigs	0.34	..	..

Note.—Camphor oil is the residue left after camphor sublimes over.

Oil content of different parts of the Japanese camphor tree

Twigs ..	..	..	..	2.21 per cent.
Branches ..	..	..	..	3.70 "
Stem ..	..	..	..	3.84 "
Stump ..	..	..	..	5.49 "
Root ..	..	..	..	4.46 "

From the above, it will appear that the possibilities of camphor cultivation on a large scale are not very promising. Extensive researches carried out by Howard, Robertson and Simonsen (1923), however, show that, with proper care, it is possible to increase the oil content of the plant. They calculate that with 900 bushes per acre planted 7 feet by 7 feet apart, the yield per acre per annum is 100 lbs. of camphor oil giving 43 lbs. of camphor. At least 50 inches of rain in the growing season is required by the camphor trees and intending cultivators should choose Southern India where the annual rainfall is 40 inches or more. If these points are attended to, there is every reason to hope for better prospects than have hitherto attended camphor cultivation.

Economic aspects.—The importance of camphor lies in the fact that it is one of the constituents of celluloid and allied products. Nearly 70 per cent. of the total output of camphor is employed in their manufacture, 15 per cent. is used for disinfecting and deodorising purposes, and 13 per cent. for medicinal purposes. Camphor is imported in very large quantities in India. According to the report of the Senior Trade Commissioner with the Government, during six months ending in September 1931, though trade in general has undergone a marked depression, the import of

camphor has slightly increased from 11 lakhs to 12 lakhs. If, therefore, camphor could be successfully produced in India, it will be of some economic importance. Camphor cultivation has been zealously conducted in the United States of America and after years of failure the Americans have, it is understood, attained a fair amount of success. In Indo-China, Sumatra, Java, and Italy camphor trees have been successfully grown. In Algeria, considerable progress has been made. Japan has been able to increase her camphor production in 1930 chiefly owing to improvements in the methods of manufacturing. If these improved methods are adopted in India, camphor production sufficient at least to meet the internal demands of the country may be possible.

Synthetic camphor.—The exploitation and successful utilisation of the indigenous camphor resources, however, are faced with grave difficulties and there is every probability that, in the near future, manufacture of camphor from vegetable sources may completely cease. With the rapid growth of the science of chemistry camphor has been successfully synthesised from the terpenes and this synthetic camphor is gradually taking the place of camphor obtained from natural sources in the commercial world. Synthetic camphor is easily prepared and the finished product may soon be offered for sale at such a price that growing of camphor-containing plants may not be a paying proposition. To what an alarming extent the synthetic camphor is capturing the field may be estimated from the average amount of production of the material in Germany alone. In 1928 and 1929, the trade returns showed an average production of 6,000 to 7,000 metric tons a year of which approximately one half—3,049 metric tons—was exported to other countries in 1929. The fate of the camphor industry, it would appear, is fast approaching that of indigo which was formerly a very thriving industry but has been blotted out of existence by the production of aniline dyes and synthetic indigo. As things are at present though synthetic camphor is capturing the markets, Formosa still supplies about 70 per cent. of the world's requirements but the position may soon change completely.

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THE SIGNIFICANCE OF THE WIDAL REACTION AND OTHER LABORATORY FINDINGS IN TYPHOID FEVER

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In treating a number of cases of typhoid fever within recent years, I have been particularly struck by the differences in the character of the Widal reaction in different groups of these cases.

1. In some, the reaction became positive only very late in the course of the disease,

from the very commencement and continued to be so throughout the entire course of the disease.

4. In a fourth series, it attained an extraordinarily high titre some time in the course of the illness.

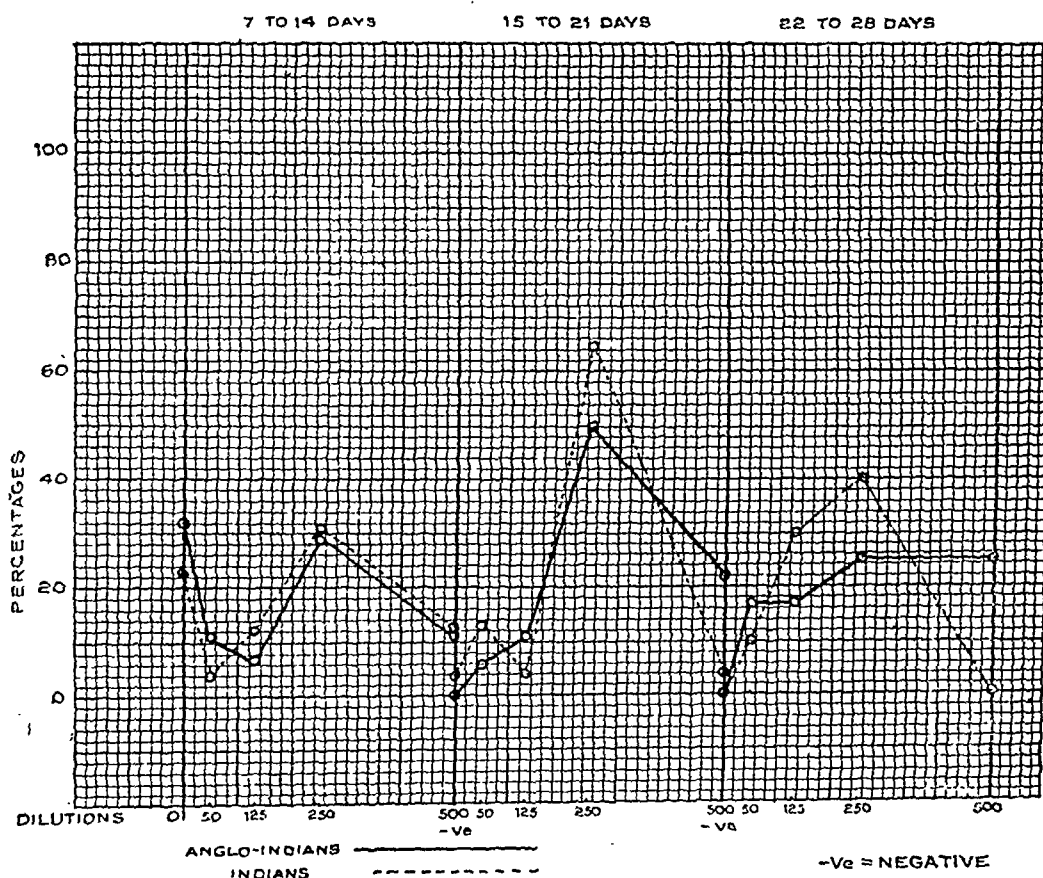
These and also several other points, noted in connection with this reaction, suggested a possible relationship between it and the clinical course of the groups of cases mentioned. The present work was therefore undertaken to study the general behaviour of this reaction, its rises and falls, effects on the clinical course, diagnostic and prognostic significance in respect of these cases.

The total number of cases available for this study was 96.

The study first undertaken was to determine the influence, if any, of age, race and sex on

GRAPH I

Percentages of Indian and Anglo-Indian patients according to their Widal reactions, during the 2nd, 3rd, and 4th weeks of typhoid fever.



even as late as after defervescence. Naturally in these cases, specially when the other laboratory findings were also negative, the diagnosis remained in doubt for a long time, giving rise to speculation and anxiety concerning their exact nature and suitability of the line of treatment followed.

2. In others, the reaction stayed so very low during the course of the disease that its value in diagnosis remained doubtful until other positive laboratory data were available.

3. In others again, the reaction was high

the character of the reaction. The effect of sex could not be satisfactorily studied as the number of female cases was comparatively much fewer but, as far as could be seen, it had no special influence in this direction.

Influence of race and age—see graphs I and II.

The graphs were prepared from the figures obtained by taking the percentage of cases in each group according to their reactions, negative or positive, in dilutions 1/50, 1/125, 1/250,

1/500, during the 2nd, 3rd, and 4th weeks of the disease.

A reference, to graph I (race), will show that there is no appreciable difference in the reactions between Indian and Anglo-Indian patients.

Graph II (age) shows that the largest percentage of high titres (1/250 to 1/500) was in patients between 26 to 40 years of age, and also some minor differences, shown in the graph, between the reactions of age-periods 5 to 10 and 11 to 25 years.

The next task was to study the general behaviour of this reaction, and its variations, in relation to the clinical course of the cases in which they occurred, *vide* graph III.

than 36 days. There were 35 cases in this series.

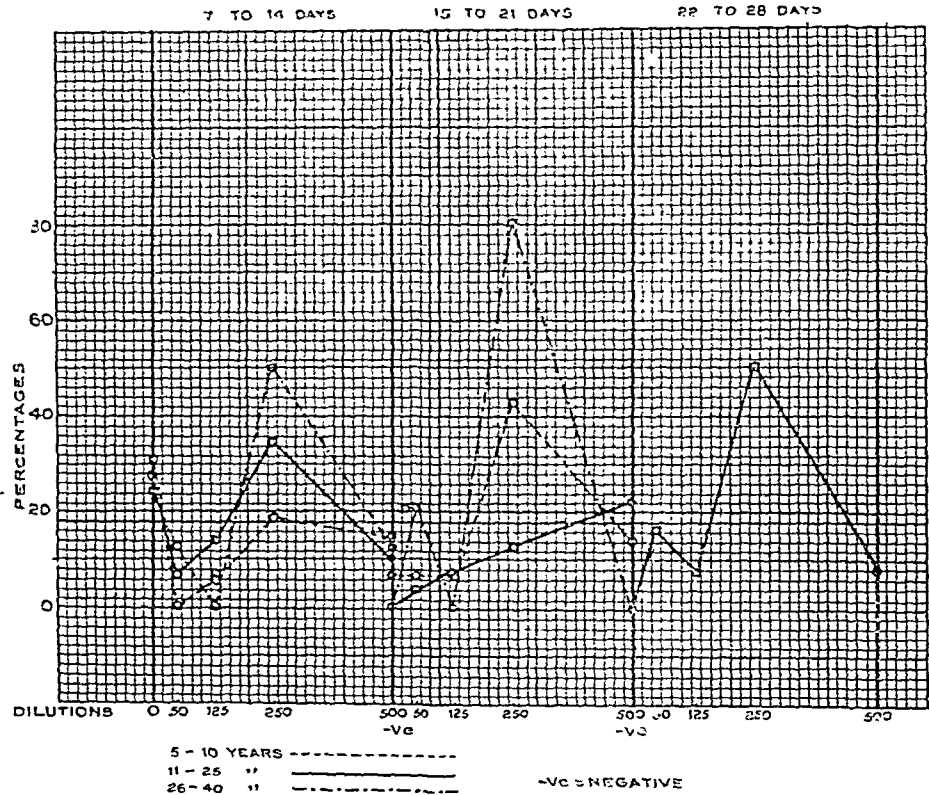
(iv) Group IV.—Short cases in which the duration of fever was 21 days or less. There were 23 such cases.

The age distribution of the above groups of cases is given below :—

Age-periods	1-4 years	5-10 years	11-25 years	26-40 years	40 years up	Total
Relapse ..	..	2	3	2	1	8
Long ..	..	4	7	1	..	12
Average ..	1	10	19	3	2	35
Short ..	2	6	8	5	2	23

GRAPH II

Percentages of patients of different age-periods according to their Widal reactions, during the 2nd, 3rd, and 4th weeks of typhoid fever.



Seventy-eight cases were available for the purpose of this study. The cases were divided into four groups according to the character and duration of the fever.

(i) Group I.—Cases in which the fever relapsed. There were 8 cases of this nature.

(ii) Group II.—Long cases in which the duration of fever was 36 days or more. The number of cases in this group was 12. The longest duration of unbroken pyrexia, seen in this series, was 62 days in one case, that of an Anglo-Indian male, aged 35 years.

(iii) Group III.—Average cases in which the duration of fever was more than 21 and less

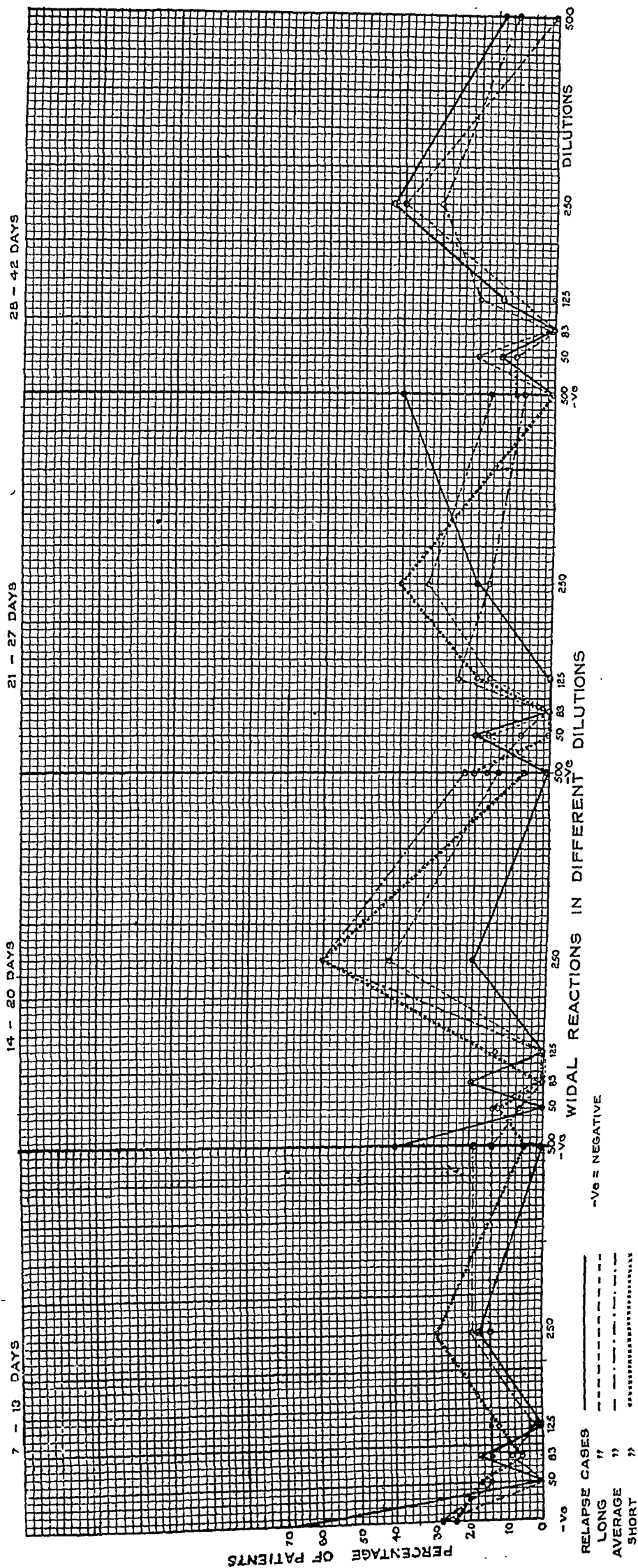
The graph was prepared from figures obtained by taking the percentage of cases in each group according to their reactions, negative or positive, in dilutions 1/50, 1/83, 1/125, 1/250, 1/500, week by week, for four weeks from the time the patients came under observation.

A study of this graph shows that :—

(i) the cases in which the fever relapsed have given the highest percentage of negative reactions, a low percentage of positive reactions in dilution 1/250, and lowest percentage in dilution 1/500, during the 2nd and 3rd weeks of the disease. During the 4th week, however, they have given a high percentage of positive

GRAPH III

Percentages of patients of different groups, shown below according to their Widal reactions, week by week.



reactions in dilution 1/250, and highest percentage in dilution 1/500, a feature which has been maintained during the succeeding fortnight.

(ii) the percentage titre curve of long cases runs closely parallel with that of the former group, but at a slightly higher level in the 2nd and 3rd weeks, and at a slightly lower level in the 4th week and succeeding fortnight.

(iii) the short cases have given the lowest percentage of negative reactions during the 2nd and 3rd weeks, and highest percentage of positive reactions in dilution 1/250, during the 2nd, 3rd, and 4th weeks. The highest percentage of positive reactions in dilution 1/500, during the corresponding period, is given by the average cases mentioned hereafter.

(iv) the titre curve of average cases occupies an intermediate position between that of the short and long cases during the 2nd and 3rd weeks, and a lower level during the 4th week.

From the findings noted above, it will be seen that the tendency of the Widal reaction, in relapse and long cases, has been to appear quite late in the course of the disease and also in very low dilutions, and to become well marked and sustained towards their declining periods. On the other hand, in the short and average cases, the tendency of the reaction has been to appear not only quite early in the course of the disease, but also in high dilutions. So that from the nature of the reaction, both in time of appearance and agglutinating power, it may be possible to form an idea of the length of the period that the disease is likely to last. Clinical experience, in reference to the cases in the above groups, is, generally speaking, in agreement with this finding, barring

this exception, that a low titre did not always mean a long or relapsing type of fever. It is, therefore, necessary to take into consideration the clinical features of the case, together with the Widal reaction, in inferring the length of time that the fever is likely to last. When read, in this manner, it was found that cases in which there were a high degree of pyrexia and marked constitutional symptoms associated with low or late Widal reactions, or both, invariably ran a long continued or relapsing course. Secondly, cases in which there was a mild type of pyrexia and mild constitutional symptoms associated with a low agglutination titre were not infrequently cases of short duration. Thirdly, cases in which a mild type of pyrexia was associated with an early high titre were generally of the average type.

The general tendency of the reaction in the cases was to rise week by week until the fastigium was reached, and to fall to a lower level as the fever declined remaining at that figure during the stage of convalescence. There were, however, many exceptions to this, and the reactions were found to be liable to sudden and considerable fluctuations during the course of the disease. Very seldom, however, did the reaction remain at a constant figure throughout. A uniform titre throughout the course of the disease was found to be a good ground for scrutinizing the diagnosis and excluding the possibilities of a previous attack, prophylactic inoculation, or the carrier state.

A second notable feature, in connection with the reaction, was the extraordinarily high titres attained in some of these cases during the course of the disease. Table I shows the reactions and the nature of the cases in which they were met with.

TABLE I

Case number	Type of case	Widal test, titre end point	REMARKS
52	Relapse	1/12,500 on 63rd day from commencement of illness.	1st attack duration 51 days, relapse from 62nd to 68th day. 63rd day—Widal reaction as mentioned; blood culture; <i>B. typhosus</i> isolated.
39	Relapse	1/1,250 and 1/2,500 on the 20th and 27th days respectively, from commencement of illness.	Towards the end of primary attack. Duration of primary attack—25 days, followed by two relapses of 16 and 17 days' duration respectively.
62	Long	1/25,000 on the 19th day of fever.	Temperature normal on the 36th day of disease.
80	Long	1/2,500 on the 39th day of fever.	Temperature normal on the 45th day of disease.
11	Average	1/2,500 on the 16th and 18th days of fever.	Temperature normal on the 22nd day of disease.
89	Average	1/2,500 and 1/1,250 on the 21st and 25th days of fever.	Temperature normal on the 29th day of disease.
92	Average	1/2,500 on the 30th day of fever.	Temperature normal on the 32nd day of disease.
91	Average	1/25,000 on the 37th day, i.e., 11 days after temperature had become normal.	Temperature normal on the 26th day of disease.
116	Miscellaneous	1/1,250 on the 26th day of fever.	Died on 27th day of disease.

It seemed at first that these exceptionally high titres might have a modifying effect on the course of the disease, but a further study in this respect failed to show that the height of titre, by itself, had any effect either on the temperature curve, course, or severity of the disease.

Group-agglutinin reaction was met with in a number of cases of which two are quoted here, by way of illustration.

Case (i)—No. 39.

Widal reaction			
Positive for	DAYS OF FEVER		
	15th day	20th day	27th day
<i>B. typhosus</i> ..	1/250	1/1,250	1/1,250
Para A ..	1/83	..	..
Para B ..	1/83	..	..

Case (ii)—No. 88. Temperature normal on 31st day.

Positive for	DAYS OF FEVER			
	13th, 22nd and 29th days	35th day	43rd day	50th and 56th days
<i>B. typhosus</i>	1/83	1/250	1/83	1/125
Para A ..	1/83	1/125	1/50	1/833
Para B ..	1/50			

In neither of these were the bacilli recovered from the blood, urine, or stool. No difficulty is likely to be experienced in coming to a diagnosis of the nature of the infection in case (i) but case (ii) may cause some difficulty in this respect.

The following general principles, covering group reactions, may be of assistance in coming to a conclusion in such cases (vide *Practice of Medicine*, Tice, Vol. IV, page 521).

(1) If a serum agglutinates the *Bacillus typhosus* better than it does either the Para A or B organisms the disease is not paratyphoid but typhoid fever. If either of the paratyphoid organisms is agglutinated in a higher dilution than the *Bacillus typhosus*, the disease may still be typhoid fever. Group agglutinins are more likely to be present in typhoid fever than in paratyphoid fever. For this reason a typhoid serum may agglutinate a paratyphoid organism even better than the typhoid bacillus.

(2) Para A is less agglutinable than Para B. Agglutination in a dilution as low as 1 in 40 is of significance in Para A infections.

(3) *Bacillus paratyphosus B* is easily agglutinated and low dilutions are of no significance. To be of diagnostic value dilutions of serum for Para B agglutination should be high, 1 in 1,000 or even higher'.

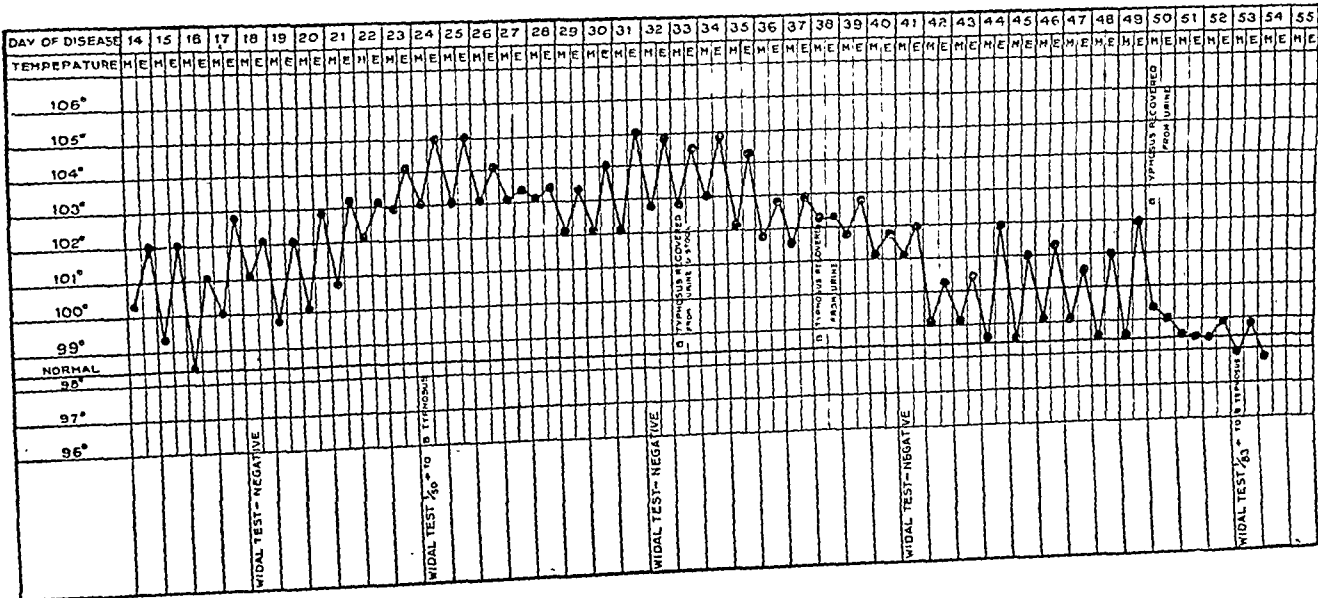
Judged by these standards and also its clinical course, case (ii) is one of Para A infection and not Para B as may be suggested by its Widal reaction.

The Widal reaction in the diagnosis of typhoid fever

(a) Failure on the part of the reaction to become positive at the expected time does not mean that the case will not ultimately prove to be typhoid.

A positive reaction is expected usually about the beginning of the 2nd week of the disease. An earlier positive blood culture may settle the

Case No. 118



Widal test — 1/50 + to *B. typhosus* on 69th day from commencement of illness

"	"	1/250 +	"	"	"	91st	"	"	"	"
"	"	+	"	"	"	99th	"	"	"	"
"	"	1/500 +	"	"	"	106th	"	"	"	"

diagnosis beyond doubt. In this series, however, there were six cases in which both the Widal reaction and the result of cultures were positive only very late in the course of the disease. The true nature of the fevers, therefore, remained in doubt for a considerably longer period than is usual in typhoid fever and gave rise to anxiety and speculations concerning their nature. The following case is a striking example of the type mentioned.

Case No. 118.—Anglo-Indian male, aged 11, was admitted into hospital, on account of fever of 14 days' duration. The fever lasted altogether for 51 days (*see chart*).

After admission into hospital, he had hemorrhages from the bowel on three separate occasions, and also several attacks of diarrhea and vomiting. He became reduced to almost skin and bone towards the latter part of the illness and, further, developed hemorrhages under the skin, in spots and patches, as big as a man's hand. His life was despaired of on several occasions, nevertheless he made an ultimate recovery and is now almost a picture of health. Turning next to the Widal reaction of the patient it will be seen from the chart that it was negative on the 18th day of fever, and after making a feeble attempt to become positive on the

24th day, became negative again and remained so till after defervescence.

Two days after defervescence, that is on the 53rd day from the commencement of the illness, the reaction again became positive in a dilution of 1 in 83. From this time onward, it never looked back, but went on becoming stronger until on the 106th day from the commencement of illness, or 55 days after defervescence, it had reached a titre of 1 in 500. The dates on which *B. typhosus* was recovered from the urine or stool of the patient are shown on the chart.

It will be seen, from the particulars given above, that the agglutination titres in this case really began to assume a diagnostic importance actually after defervescence. Secondly, the reaction, after a feeble appearance on the 24th day, became and remained negative as late as the 41st day, although the patient was actually excreting typhoid bacilli in the urine and faeces during the period covered thereby, *viz.* on the 33rd and 38th days (*see notes on chart*). The difficulties of diagnosis in a case like this can well be imagined if the Widal test alone is depended upon for the purpose. The association of a late positive Widal reaction with a severe type of disease may be noted in this connection.

The particulars of other cases in this series are given in table II.

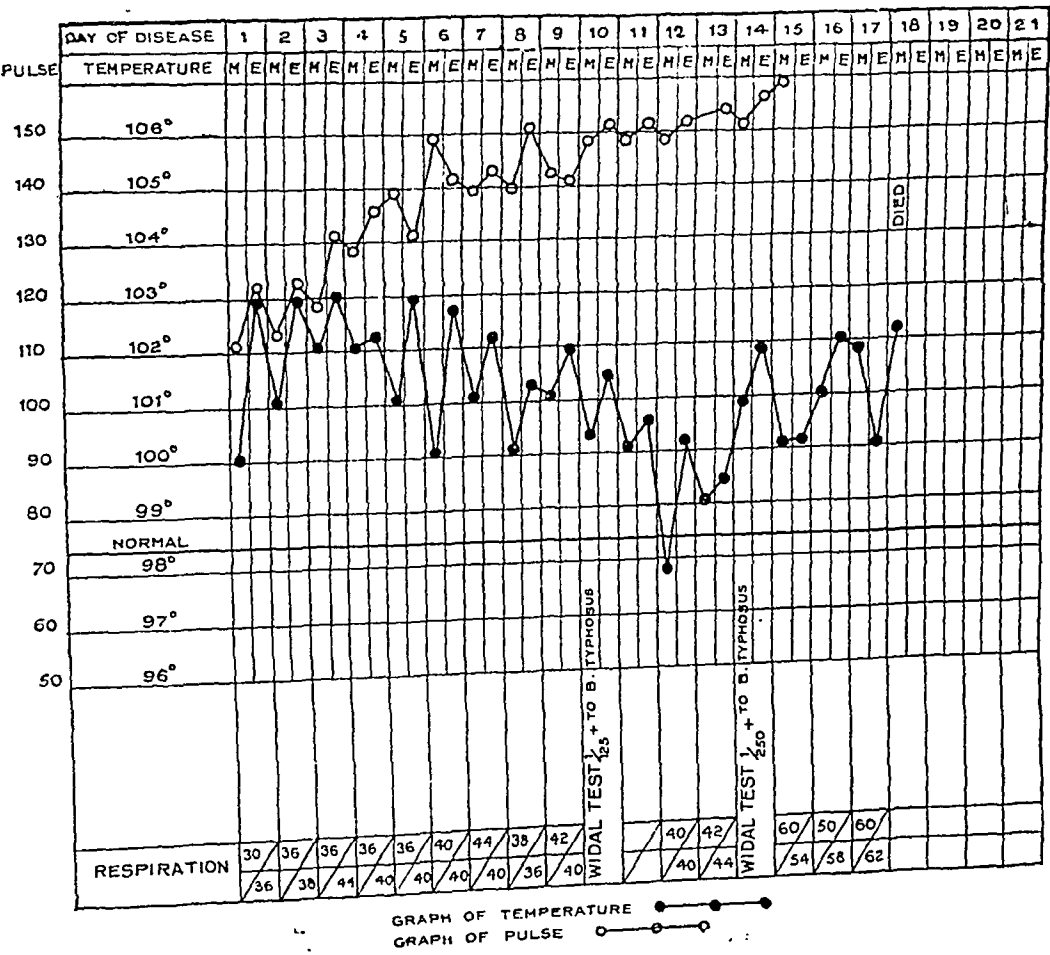
TABLE II

Case number	Type of case	PRIMARY ATTACK		RELAPSE	
		Duration of fever	Laboratory findings	Duration of fever	Laboratory findings
24	Relapse ..	10 days, admitted on the 7th day of fever.	Widal test negative on the 13th day of fever.	From the 20th to 29th day.	(1) Blood culture on the 20th day of fever—growth of <i>B. Para A.</i> (2) Widal test positive in dilution of 1/125 to <i>B. Para A</i> on the 20th day of fever.
110	Relapse ..	42 days, admitted on the 13th day of fever.	Widal test on the 15th day of fever negative. Widal test on the 20th day positive in dilution of 1/50 to <i>B. typhosus</i> . Widal test on the 29th day positive in dilution of 1/50 to <i>B. typhosus</i> . Widal test on the 37th day negative. Blood culture on the 20th day of fever— <i>B. typhosus</i> isolated.	From the 49th to 73rd day.	Widal test positive in dilution of 1/250 to <i>B. typhosus</i> on the 50th day of fever. Widal test positive in dilution of 1/250 to <i>B. typhosus</i> on the 57th day of fever. Widal test positive in dilution of 1/250 to <i>B. typhosus</i> on the 64th day of fever till 205th day from commencement of illness.
31	Long ..	40 days, admitted on the 16th day of fever.	Widal test negative on the 17th day of fever. Widal test positive in dilution of 1/250 to <i>B. typhosus</i> on the 31st day of fever. Widal test positive in dilution of 1/250 to <i>B. typhosus</i> on the 40th day of fever.		
54	Average ..	27 days, admitted on the 12th day of fever.	Widal test negative on the 14th day of fever. Widal test positive in dilution of 1/250 to <i>B. typhosus</i> on the 19th day of fever. Blood culture on the 19th day of fever. <i>B. typhosus</i> isolated.		

TABLE III

Case number	Type of case	Duration of fever	Laboratory findings
2	Long ..	40 days, admitted on the 5th day of fever.	Widal reaction positive for <i>B. typhosus</i> in dilution of 1/83 on the 6th day of fever. Widal reaction positive for <i>B. typhosus</i> in dilution of 1/83 on the 20th day of fever. Widal reaction positive for <i>B. typhosus</i> in dilution of 1/125 on the 34th day of fever.
3	Average ..	29 days, admitted on the 10th day of fever.	Widal reaction positive for <i>B. typhosus</i> in dilution of 1/25 on the 10th day of fever. Widal reaction positive for <i>B. typhosus</i> in dilution of 1/50 on the 16th day of fever. Widal reaction positive for <i>B. typhosus</i> in dilution of 1/500 on the 29th day of fever. <i>B. typhosus</i> isolated from blood on the 10th day of fever.
60	Average ..	23 days, admitted on the 10th day of fever.	Widal reaction positive for <i>B. typhosus</i> in dilution of 1/83 on the 12th day of fever. Widal reaction positive for <i>B. typhosus</i> in dilution of 1/250 on the 19th day of fever. <i>B. typhosus</i> isolated from blood on the 12th day of fever.
95	Average ..	30 days, admitted on the 18th day of fever.	Widal reaction negative on the 20th day of fever. Widal reaction negative on the 24th day of fever. Widal reaction positive for <i>B. typhosus</i> in dilution of 1/125 on the 31st day of fever. Widal reaction positive for <i>B. typhosus</i> in dilution of 1/125 on the 38th day of fever.
59	Short ..	20 days, admitted on the 5th day of fever.	Widal reaction positive for <i>B. typhosus</i> in dilution of 1/50 on the 9th day of fever. Widal reaction positive for <i>B. typhosus</i> in dilution of 1/25 on the 15th day of fever. Widal reaction positive for <i>B. typhosus</i> in dilution of 1/83 on the 30th day of fever.

Case No. 15



the two positive Widal tests remained unexplained until it was found that cultures, taken in the post-mortem room, from bile in the gall-bladder, had grown *Bacillus typhosus*. The positive Widal tests were, therefore, not indicative of the nature of the disease but of a carrier state with reference to *B. typhosus*.

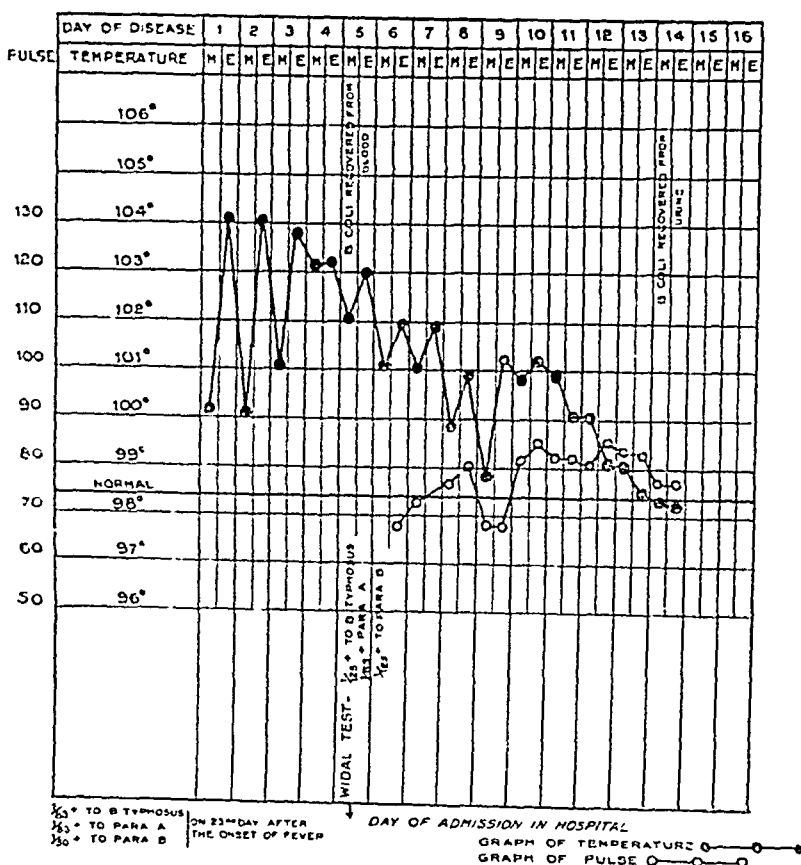
The second case presents the proposition from a different point of view—

Case No. 119 (see chart).—Male, other caste, aged 23, developed a sudden attack of fever accompanied by rigor, pain in the right loin, and dysuria. His urine on that day was turbid in appearance, contained a trace

(e) It is important to mention here the fact that the appearance of *B. coli* in the urine in cases of typhoid fever is not at all uncommon. Out of the 96 cases studied in connection with this paper, there were 16 in which *B. coli* was recovered from the urine some time or other in the course of the disease. The particulars of these cases are given in table IV.

It will be seen from the table that in two out of these 16 cases *B. coli* was recovered from the

Case No. 119



of albumin and a fair quantity of mucus. A blood count gave a total white cell count of 12,400 per c.mm., and a differential polymorphonuclear cell count of 80 per cent. A moderate abdominal distension, such as is seen in typhoid fever, was present throughout the greater part of the course of the disease. The Widal reaction on the 5th day of fever was positive to *B. typhosus* in a dilution of 1 in 125, Para A 1 in 83, and Para B 1 in 125; and on the 23rd day after the onset of fever, and seven days after defervescence, to *B. typhosus* and Para A, in 1 in 83, and Para B, in 1 in 50. *B. coli* was recovered from the blood on the 5th day and from the urine on the 14th day of fever. The patient gave a history of an attack of typhoid fever a year before the present illness, but no history of previous inoculation.

Onset of typhoid fever with marked symptoms referable to the kidneys is not uncommon. There is no doubt, however, that the patient in this instance suffered from an attack of *B. coli* infection. The association of a positive Widal reaction in a case of this nature but without the clear cut history of this case is likely to give a wrong diagnosis of nephro-typhoid, if this reaction alone is relied upon for the purpose.

urine as early as the 8th day of illness. The agglutination titres of these two cases, about this time, were only 1 in 83 positive for typhoid. If further laboratory tests had not been done later on, the presence of *B. coli* in the urine might have been considered of greater importance in diagnosis than a weak Widal reaction. In the other cases *B. coli* was recovered either during the height or the declining period of the disease, and in 3 cases after defervescence. The appearance of *B. coli* in the urine, in the cases given, did not produce any special symptom or noticeable effect on the course of the disease.

(f) From what has been said, so far, it is apparent that a positive Widal reaction is not by itself a very satisfactory proof of typhoid fever. The most satisfactory proof is, undoubtedly, the recovery of the bacillus from the

TABLE IV

Case number	Type of case	HOW DIAGNOSED			<i>B. coli</i> isolated from urine	REMARKS
		Blood culture	Widal reactions	<i>B. typhosus</i> in urine		
39	Relapse ..	..	Between 1/250 to 1/2,500.	..	Pure growth on the 19th day of fever. Pus cells +.	Duration of primary attack of fever—25 days.
52	Relapse ..	+	Between 1/250 to 1/12,500.	39th day	Pure growth on the 40th day and 44th days of fever. Pus cells + +.	Duration of primary attack of fever—51 days.
110	Relapse ..	+	From 1/50 to 1/250.	..	1. Pure growth on the 71st day. 2. Pure growth on the 82nd day. 3. Pure growth on the 110th day. Pus cells + +.	1. <i>B. coli</i> recovered from the urine, during the stage of relapse, lasting for 25 days, 2 days before the temperature became normal. 2 and 3. Recovered 10 and 27 days after defervescence respectively.
2	Long ..	..	From 1/83 to 1/250.	..	1. Pure growth on the 8th day of fever, pus cells—Nil. 2. Pure growth on the 16th day of fever. Pus cells +.	Total duration of pyrexia is 40 days.
31	Long ..	..	1/250	..	Pure growth on the 39th day of fever. Pus cells—Nil.	Total duration of pyrexia is 41 days.
13	Long ..	+	From 1/83 to 1/250.	..	1. Pure growth on the 8th day of fever. 2. Pure growth on the 13th day of fever. Pus cells +.	Total duration of pyrexia is 49 days.
28	Average ..	+	Moderate	..	Pure growth on the 27th day of fever. Pus cells +.	Temperature normal on the 32nd day.
30	Average ..	+	High (1/833)	..	Pure growth on the 41st day Pus cells +.	Temperature normal on the 34th day.
89	Average ..	..	Between 1/250 to 1/2,500.	..	Pure growth on the 26th day of fever. Pus cells + +.	Temperature normal on the 29th day.
3	Average ..	+	From 1/25 to 1/500.	..	Pure growth on the 29th day of fever. Pus cells—Nil.	Temperature normal on the 30th day.
10	Short ..	..	High (1/833)	..	1. Pure growth on the 11th day. 2. Pure growth on the 13th day. Pus cells +.	Temperature normal on the 7th day.
12	Short ..	+	..	..	1. Pure growth on the 11th day of fever. 2. Pure growth on the 17th day of fever. Pus cells + +.	Temperature normal on the 19th day.
100	Short ..	..	1/250	..	Pure growth on the 18th day. Pus cells +.	Temperature normal on the 17th day.
14	Not grouped	..	1/250	..	Pure growth on the 16th day of fever. Pus cells + +.	Discharged otherwise on the 26th day of fever.
35	Not grouped	+	Moderate	..	Pure growth on the 15th day of fever. Pus cells +.	Died on the 19th day of fever.
116	Not grouped	..	High (1/1,250)	..	Pure growth on the 20th day of fever. Pus cells—Nil.	Died on the 27th day of fever.

+ = *B. typhosus* isolated from blood.

blood and other secretions and excretions of the body. The disposition to place too exclusive a reliance on the Widal test in the diagnosis of typhoid fever has grown out of the belief that positive results from blood culture are very unlikely after the first week of the disease. This view has, I believe, been unduly stressed; and late positive blood cultures in typhoid fevers are not at all uncommon. Out of the 96 cases studied, there were no fewer than 24 in which *B. typhosus* was recovered from the blood during the second and subsequent weeks of illness. The particulars of these cases are shown below:—

Recovery of B. typhosus from blood late in the course of the disease

Period of illness during which recovered	10th to 15th day	17th to 22nd day	24th to 28th day
Number of cases in which recovered	14	6	4

These findings furnish a good reason for resorting to blood cultures, week by week, in continued fevers. The practice is more than likely to be rewarded by a positive result, putting the diagnosis beyond all doubt.

THE VITAMINE VALUE OF THE FOOD FATS OF BENGAL

(A PRELIMINARY STUDY)

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MUSTARD OIL and ghee are the only two fats which enter as such into the dietary of the people of Bengal. Mustard oil is taken throughout the province, in towns as well as in villages, by the rich as much as by the poor. Ghee is much more used in the towns than in the villages and by the richer and the more well-to-do than by the mass. Both are used for culinary purposes, ghee particularly for cooking sweets. Occasionally they are taken by mixing with boiled vegetables, and ghee also with cooked rice, the latter always in such cases being first brought to the boil. Though of such dietetic importance, no study has been made, so far as I know, on the vitamine contents of mustard oil. The only works on ghee in this direction that I could find on record are those of Ghosh (1922) and of Bacharach (1930). Ghosh found by feeding experiments on rats that ghee was equivalent in vitamine value to the average butter. But his ghee was not the ghee of the Indian market nor yet of the villages of Bengal; it was the ghee of the villages of Upper India, chiefly of the provinces of Allahabad, Agra and Oudh, it is the 'kacha' or underdone ghee, melted at a low temperature, containing an

appreciable amount of curd and water, is in fact impure butter fat, more or less rancid when collected by the manufacturers. The ghee of the Indian market as well as of the Bengal villages is not merely melted out from butter and dried of water, but is heated to its own boiling temperature both to bring out the aroma for which it is valued and to destroy the curd in order to ensure its keeping quality. The manufacturers of ghee after making their collections from the houses of several villages boil their blend for these purposes. Then, as has already been mentioned, the ghee is as a rule heated to its boiling point in cooking before it is taken as food. Bacharach made his experiment on a rat with a sample of ghee which he got from Bombay, and though the unsaponifiable matter extracted from this ghee gave the blue colour with antimony trichloride, the result on the rat was negative, but we do not know if this sample was genuine.

This is the state of things, and we are frequently pressed for our opinion regarding the vitamine value of these articles and specially of ghee. I found ready to hand a brood of young albino rats belonging to my assistant Mr. N. K. Chatterji, and Mr. Chatterji at once offered them to me for which I acknowledge here my indebtedness to him. I hastened to avail myself of this opportunity to test these fats on them. The following paragraphs give an account of the work and the results thereof. In carrying out this experiment, I could not keep to the details of the very sound lines prescribed by the Accessory Food Factors Committee in their report to the League of Nations Health Organisation as given in the *Lancet*, 1928, Vol. I, p. 148. The reasons for the departures will appear in their respective places.

Rats.—The rats under the experiment were seven in number, all of the same litter, they were not 20 to 30 days old, but were already 9 weeks old before the experiment could be arranged. They were between 40 and 50 grammes in weight.

Basal diet.—The basal diet used was as below:—

Casein	..	..	19
Starch	..	..	55
Lard	..	..	16
Yeast	..	..	5
Salt mixture	..	..	5

This was practically the same as that of Drummond and Coward (1920) used by Dr. Ghosh. But I omitted orange juice as it might contain vitamine A and further as rats are not known to suffer from scurvy (1929). I used Merck's soluble starch in place of rice starch and lard in place of the purified reduced vegetable oil of the formula, and for the yeast extract in it I also used Merck's

medicinal yeast. I purified the casein by heating it at 120°C. in thin layers exposed to air and towards the end of the experiment by treating it in a Soxhlet flask with petroleum ether. The salt mixture of the diet was after the formula of McCollum and Simmonds (1918), but by an oversight the calcium lactate in my salt mixture was one-tenth of what is given in the formula; this deficit of lime was however a common factor in the diet of all my rats and, as will be seen below, did not prevent normal growth in the control animals. For anti-rachitic vitamine I had to depend upon exposing the animals to the diffuse light of the setting sun, not without success as is evident from the growth of the control animals and from examination of the bones of those which succumbed.

Fats.—My test fats were of course mustard oil and ghee. For depletion of the vitamine A as a preparation for the test I used lard. Butter fat was used as control. The mustard oil was the pure oil we got from a jail in this province. The ghee was a mixture of samples found genuine in our laboratory and blended in the usual way. The butter fat was the milk fat melted out of Keventer's butter on a water bath; I had no time to prepare my own butter. Keventer's butter is among the best in the market.

Procedure.—One pair of these rats were given butter fat for the whole of their fat food throughout; these served as control for the completeness of and balance in the proximate principles of the diet and sufficiency of the

other vitamines in it. The other five rats were given lard first. After the depletion of vitamine A in them, as shown by fall of weight in one and its becoming steady in three, which took twenty-three days, the whole of the lard was replaced by the same weight of the test fats and of the control, *i.e.*, of the butter fat, though the weight was still rising in the remaining one. Two of them got mustard oil, two ghee, and the one which had lost weight got butter fat. I could not get three animals for each of these groups, the five being all that were available. I did not begin by adding my test fats in small quantities, because my aim was not quantitative but, for the present, only qualitative; my object was not to ascertain the minimum dose of these fats which would restart growth but to find out if they contain the vitamine at all in amount commensurate to the physiological requirements. So the dose given was the maximum of these fats which the rats could possibly take, forming as it did about 16 per cent. by weight of the food. In case the vitamine was found in them, my object was to follow it up by the finding in them of the quantity of it. Lastly instead of stopping at the end of the 4th week, I prolonged the experiment for over another week as the animals kept on butter fat and thriving on it suddenly got ill with diarrhoea and, in consequence, it became necessary to prolong the observations on them.

Result.—The result of the experiment is given in the following table under the dates shown :—

Weight in grammes

RATS		ON LARD			ON TEST FAT						Test fat	REMARKS
Number	Sex	23.7	3.8	9.8	15.8	22.8	29.8	5.9	12.9	19.9		
I	Male ..	50	70	75	50	60	70	85	80	75	Butter fat Mustard oil	Died on 28th August, weight 50 gm.
II	Male ..	55	80	100	100	75	..	..	..	..
V	Female ..	50	50	65	70	70	65	65	65	..	"	Died on 18th September, weight 50 gm.
IV	Male ..	50	70	75	75	50	60	60	60	..	Ghee	Died on 15th September, weight 50 gm.
III	Female ..	40	60	65	65	70	70	50	55	55	"	Died on 20th September.

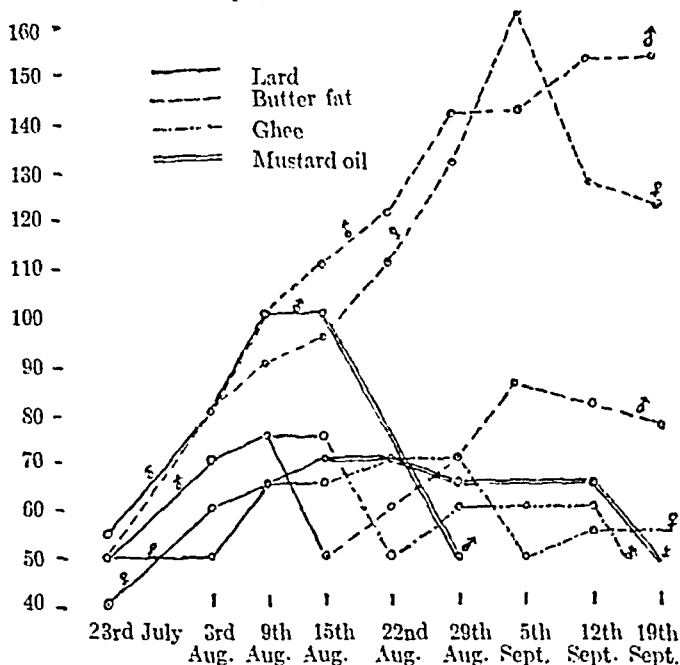
On butter fat throughout

Sex.	23.7	3.8	9.8	15.8	22.8	29.8	5.9	12.9	19.9
Male ..	50	80	100	110	120	140	140	150	150
Female ..	50	80	85	95	110	130	160 *	125	120

* Was pregnant: brought forth 9 young ones on the 6th September.

The relative nourishment of the rats on these different fats in the experiment will be seen at a glance from the following graph:—

Vitamine value of butter fat, ghee and mustard oil.
[As found on rats].



(1) *Butter fat*.—The curve of growth of the two rats kept from the beginning on butter fat for the fat food is the same as that of the normal growth of Osborne and Mendel given on page 123 of Funk's *Vitamines* (1922). Their rats as well as ours started from 50 grammes, their rats grew to 150 grammes in 49 days, our male rat reached that weight on the 51st, our female rat on the 44th day weighed 160 grammes, but she was pregnant and on the following day gave birth to nine young ones. The ration for these rats was therefore well balanced.

The result of the butter fat on the rat depleted of the vitamines is also remarkable. This rat after rising from 50 grammes at the start to 70 grammes by the 17th day suddenly developed xerophthalmia with photophobia and depilation specially round the eyes, had inflammation of the respiratory passages and lost 20 grammes in 6 days. The dyspnoea was intense with the head thrown up with each respiration and the animal was in the last stage when the lard was replaced with butter fat. The effect of the change was marvellous; in three days the dyspnoea disappeared; in the course of a week the animal opened its eyes; the ulcer which had formed on the left cornea healed up, the fur improved and in three weeks the body weight went up from 50 grammes to 85 grammes. At this stage, it had diarrhoea of a severe type, passed into a low condition, lost weight dropping to 80 grammes in seven days and 75 grammes on the 19th September

the closing day of the experiment, and expired on the 23rd. (a) The diarrhoea was not accompanied by any suggestion of xerophthalmia, the animal looked about throughout with open eyes and the eyes were bright to the last; (b) the disease also attacked simultaneously the other two rats on butter fat, the female one suffering severely from it; (c) it was limited to these rats only, those on the other fats passed normal stools; on the outbreak of the disease, the food of these three rats for the week was found rather offensive smelling and it was further found that some food which had accidentally dropped on the ground was returned to the bottle; hence it is very likely that the disease was an infection carried through the food of these three rats.

(2) *Mustard oil* failed to restart growth. The two rats on it had photophobia and rough coats. In the male which had remained steady at 100 grammes in the last week of the lard diet the weight dropped to 75 grammes in one week, and in another six days the animal died, weighing 50 grammes. The female rat had still been putting on weight and was at 70 grammes when she got the mustard oil, she remained steady at 70 grammes for one week, then dropped to 65 grammes by the next week, continued at that weight for the succeeding two weeks and died after 6 days more with the weight at 50 grammes. Both these animals had no symptoms apart from photophobia and rough coat, the deaths were rather sudden. On post-mortem the organs were found normal, the intestines empty and the bones well formed and not soft.

(3) *Ghee*.—The male rat which had steadied at 75 grammes on lard developed inflammation of the respiratory passages, photophobia and depilation and dropped to 50 grammes in the first week on ghee, recovered from the respiratory inflammation and put on 10 grammes in course of the next week, continued at that level for the two next succeeding weeks and dropped to 50 grammes and died in another three days. The symptoms of avitamosis were very much pronounced in this rat, the depilation was advanced, the fur was very rough, the xerophthalmia ended in destruction of the cornea and blindness, the temper became irritable, the animal was snappish and moved round and round in frenzy with recesses of rest. The bones of this animal too showed no signs of rickets. The female which had begun with 40 grammes halted at 65 grammes in the last week on lard, put on 5 grammes in the first week on ghee, continued at 70 grammes through the next week, dropped to 50 grammes in third week, rose again to 55 grammes in another week and was still 55 grammes on the last day of the experiment. The symptoms of avitamosis were marked. It died 12 days after with extreme xerophthalmia.

Conclusions.—From the above experiment we may fairly conclude :—

(1) that mustard oil, if used as the only source of vitamine A for a growing animal, can neither promote growth nor even support life; (2) that though butter fat contains a fair amount of vitamine A, ghee is little better than mustard oil in this respect. But in connection with ghee we must remember the above experiment bears on

(a) the *genuine ghee* of the Bengal Food Adulteration Act, i.e., ghee that passes the standards of the Act. It cannot apply to

(b) the 'kacha' or imperfectly melted out ghee of up-country villages, which, as I have already pointed out, is practically impure butter fat more or less rancid, and which, no wonder, Dr. Ghosh found to be equivalent in vitamine value to the average butter. It may not also apply to

(c) the inferior ghees of the market which are adulterated, perhaps among other things with the 'kacha' ghee, or are heated just sufficiently to put off the decomposition till passed on to the customers, with the fraudulent object that the water and the curd of the 'kacha' ghee add to the weight of the commodity. It must have been with some adulterated ghee like this that Dr. Ghosh could restart growth in rats while he failed to do so with his remelted ghee.

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A PRELIMINARY REPORT ON *BACILLUS COLI* IN THE CALCUTTA FILTERED WATER SUPPLY

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THE subject of *Bacillus coli* infection of water supplies has been exhaustively dealt with from time to time by numerous bacteriologists. It may not be out of place here to give a brief note regarding their work—a subject which is well summarised in the textbook of bacteriology by Wilson and Topley. The question of differentiation of strains of coliform bacilli commenced with the work of Kraus (1894), Refik (1896), Grimbert, Durham and Jordan (1903), who established certain primary divisions as the result of a few sugar reactions and

certain biochemical tests. Next came Deenham, MacConkey (1905–1909), Bergy (1908), Jackson (1911), who made further subdivisions and a more elaborate classification. Horden and his colleagues in 1901–1906 showed that coliform bacilli are divisible into two well-defined classes by the ratio of evolution of $\text{CO}_2:\text{H}$. Though Voges and Proskauer devised a colour reaction in 1898, it was Horden and his colleagues in 1906–1911 who elucidated the real nature of the Voges-Proskauer reaction and the value of it in the classification (acetylmethyl carbinol test). Clark and Lubs in 1915 devised the 'methyl red test' as an aid for differentiating the coliform group into genera. From 1916–1926 as many as seven bacteriologists—Johnson, Hulton, Levine, Burton, Rettgar, Winslow, and Bradsley—were all engaged in the further subdivision of the Voges-Proskauer-negative, methyl red test-positive group—i.e., the *Eischeria* or typical type—on the basis of fermentation reactions. Brown in 1921 introduced citrate media for the differentiation of pathogenic vibrios from harmless water-commensals. Koser in 1926 used the citrate media not only in differentiating the two broad divisions from one another, but even used them successfully in differentiating the intermediate forms. Recently, Koser and Smith perfected the citrate media, using a citrate green medium—with bromothymol as indicator,—a method which I have found very useful. Jones and Wise in 1926 introduced the use of cellulose, a glucoside derived from cellulose, as a differentiating agent for the intermediate forms (this, however, I have not used myself).

The list would not be complete without referring to the work of Castellani and Chalmers, and of Sir Alexander Houston of the London Metropolitan Water Board, and to the very important work carried out by Colonel Clemesha, I.M.S., in connection with the bacteriology of surface waters in India.

My own aim has been to corroborate the findings of previous workers, and to study any peculiarity or irregularity in the behaviour of coliform organisms as isolated from the Calcutta water supply and Calcutta sewage.

I have tried to investigate the following points :—

(i) What are the types of *B. coli* present in the Calcutta filtered water supply and Calcutta sewage.

(ii) If there is any preponderance of the sewage type of *B. coli* in the Calcutta filtered water supply.

(iii) If the types of *B. coli*, other than from human sources, i.e., *B. coli* isolated from bird's droppings (crow and pigeon), can be isolated from the filtered water supply. This seems to be somewhat important to me, as the lids of the cisterns of most houses are kept open.

(iv) A study of the bacteria in general, as isolated from water, sewage, bird droppings as regards :—

- (a) Metabolic properties—formation of indol, presence of ammonia, reduction of nitrates, presence of catalase, reduction of methylene blue and presence of H_2S .
- (b) Acid agglutination.
- (c) Viability of the bacilli in tap water, distilled water at different pH range and the rate of multiplication or diminution at such pH.
- (d) Salt action of the bacteria.
- (e) Action of ordinary disinfectants.

Before proceeding with the main subject, I would like to point out that conditions here are quite different from those prevailing in Europe or America—in the latter the river source of supply is always grossly sewage polluted and natural purification is extremely rare. But here, as Clemesha has pointed out, India is a land of unpurified water supplies for the most part or, to be more correct, a land where purification does exist but is brought about by purely natural agencies. Now let me take up the Hooghly water which is our source of supply and discuss briefly the extent and power of these natural agencies to reduce the total number of bacilli in the water supply.

During the winter a great amount of self purification takes place, the following factors playing an important part.

Firstly, sedimentation is very effective. We know that bacteria exist in the surface layer of water, clinging to large particles in suspension. So the reason why sedimentation causes reduction of bacteria is evident. The factors which cause this sedimentation are (a) absence of flood and surface washing, i.e., absence of a foothold for and food of bacteria; (b) colloidal changes, negatively charged colloids, e.g., clay combining with the positively charged colloids, e.g., alum (traces of which have been found by Dr. Mukherji of our laboratory to be more evident during the winter months) causing the precipitation; (c) less viscosity of the water during the winter periods. This sedimentation is greatly supplemented by storage for 48 hours, which process greatly reduces the total number of bacteria. This is of course due chiefly to time, the action of the ultra-violet rays of the sun, absence of particles as the result of further sedimentation and other obscure factors, e.g., osmotic pressure (Winslow and Prescott).

Secondly, the germicidal action of the ultra-violet rays of the sun. Here a good deal of investigation has been carried out by Major Clemesha on surface waters. We know that this action is limited to only the surface layer of water—the clearer the water, the greater the action. Major Clemesha has classified the coliform organisms into three well defined

groups according to their capacity to resist the action of ultra-violet rays of the sun.

(i) Delicate and dangerous types—e.g., *B. coli communis*—are very rapidly killed by this action.

(ii) Intermediate groups—more resistant. He has not however given any definite species.

(iii) Resistant types—as *B. cloacæ*.

During the winter this action of the rays is most effective and consequently reduction of *B. coli* in the raw as well as in the settling tanks is evident.

Thirdly, biological activity. Algae and saprophytic organisms kill and devour up these bacteria. These algae are much more common during the winter (more particularly after the rains). Hence there is a certain amount of reduction in the number of bacteria. Besides these, there is dissolved oxygen which is carrying out the process of oxidation. All these factors combine to reduce the number of *B. coli* during the winter months.

Lastly, probably bacteriophage action is more effective during the winter months, though proof of this is lacking.

During the monsoon, however, the conditions are reversed. Though chemical purification is going on on account of the dissolved oxygen, there is absolutely no sedimentation, hence very little action of the ultra-violet rays, and bacteriological purification is practically nil as the result of surface washings and flood. Hence *B. coli* is much more in evidence in the filtered water supply at this time. Besides, there is another factor to be considered, i.e., it is very difficult to control the filter beds during the monsoon, which may also account for the excess of the presence of *B. coli* to a certain extent. For the present I have not taken into consideration the chances of contamination through the distribution system.

I give below very briefly the incidence of *B. coli* in relation to rainfall and seasonal variation.

Raw river water, as examined at Pulta water works, shows *B. coli* in 1 c.cm. This however is less evident during the period beginning with October and ending in April. From May the curve rises and reaches its peak in September.

Water from the settling tank, after 48 hours' settling, shows great reduction of *B. coli*—the causes of reduction I have stated before. Generally during the greater part of the winter *B. coli* is absent in 1 c.cm. and rarely in 5 and 10 c.cm. But during the monsoon it is always present in 1 c.cm., especially during July, August and September.

Filtered water from the tap at Tallah shows *B. coli* negative in 10 c.cm. of water during the major part of the year, but it is more often positive during the monsoon.

We may next take up the detailed study of this organism under the following heads :—

- (i) Typing of the *B. coli*.

- (ii) Metabolic properties, indol reaction, evolution of ammonia and sulphuretted hydrogen, reduction of nitrites, presence of catalase and reduction of methylene blue.
- (iii) Acid agglutination.
- (iv) Salt action of the bacteria.
- (v) Viability at different pH range.
- (vi) Action of disinfectants.

Classification and identification of the types of *B. coli*

The old method of classification of the bacilli into typical and atypical or fæcal and non-fæcal only by the Voges-Proskauer reaction and sugar fermentation, has been supplemented in recent years by the Koser-Smith modifications of citrate media, methyl red tests and more elaborate and correct sugar reactions and biological tests. Even then, there are some fallacies in classifying the bacteria into typical or fæcal, and atypical or non-fæcal, rejecting the atypical ones as harmless, as there are some types of *B. coli* belonging to the atypical group, e.g., *Ærobacter aerogenes* or *Ærobacter cloacæ* which may be found in human stools. Again there are certain types of *B. coli* which cannot be classified into any of these groups, i.e., either *Eischeria* or *Ærobacter*—Voges-Proskauer test negative, methyl red test negative, and Koser negative. We may, however, for the present, classify the organisms into two genera, namely, *Eischeria* and *Ærobacter*, laying more stress on the *Eischeria* group as the more potent indicator of pollution. Next, the question of motility and sugar reactions comes in. As regards the sugar reactions, I may mention that different authors give different opinions as regards the fermentation of a particular sugar—e.g., in *B. coli communior*, Winslow, Kligger and Rothberg in their classification in 1919 hold that salicin is not fermented, whereas Bergy (Determinative Bacteriology) says that it is fermented. Again variation in one or more sugars does occur and makes the identification extremely difficult—to this I shall refer later on.

As regards motility, some authorities lay more stress on the sugar reactions as, according to them, the motility may vary with the changes in the antigenic structure of the bacilli, i.e., dropping of the flagellar or H antigen in an artificial environment, the O antigen or the somatic antigen remaining intact. So there is still a certain amount of muddle but I hope in future this will pass away. I have followed Bergy in my broad classification into *Eischeria* and *Ærobacter*. I have done the Voges-Proskauer test, methyl red test, supplemented by the Koser-Smith modification of the citrate green medium which changes from green into blue in the case of *Ærobacter*. As to the sugar reactions, I have followed the table given by

Winslow and Prescott and to some extent Bergy.

I have examined in all 130 samples of filtered water, collected from the different parts of the city. I give my results below.

Total number of samples—130. Total number rejected due to contamination, chiefly due to *B. pyocyaneus*—27. Total number belonging to genus *Eischeria*—19 (mostly isolated during August and September 1931). I have limited myself only to the following types—namely *E. neopolitanus coli*, *E. coscoroba*, *E. Grünthal*, *E. immobile* or *enterica*, *E. coli communior*, *E. acidi lactici*, *E. coli communis*, and have not taken into account the other 22 varieties of *Eischeria coli* on account of the difficulty of preparing the gelatine media which have been extensively used by the continental bacteriologists. Again the margin of differentiation in some of these types is so delicate that it has not been possible for me to follow—*E. neopolitanus* 5 instances, *E. coscoroba* 3 instances, *E. Grünthal* 3 instances, *E. immobile* 1 instance, *E. communior* 2 instances, *E. acidi lactici* 2 instances; total 16. In 4 instances the *B. coli* isolated belonged to the *Eischeria* group, i.e., methyl-red test positive, but they cannot be classified into any species on account of variation in one or more sugar reactions, which I shall deal with later on. Total number belonging to the genus *Ærobacter coli*—64. The following are the proportion of the types; *A. cloacæ*—34, *A. aerogenes*—21, *A. oxytocolum*—4, *Ærobacter*, but cannot be typed—5.

Calcutta sewage.—In all instances, *B. coli* has been found in a dilution of 1 in a million. Total number of sewage samples examined—26. Total number of samples which had to be rejected owing to contamination with *B. pyocyaneus*—5.

Total number of *B. coli* belonging to the *Eischeria* group 3, *E. neopolitanus* 1, *E. coli communior* 2.

Total number of *B. coli* belonging to genus *Ærobacter* 18, *A. cloacæ* 8, *A. oxytocolum* 4, *A. aerogenes* 2.

Another 3 samples behaved just like *A. oxytocolum* except for the reaction on inulin. One sample belonged to the *Ærobacter* group but cannot be identified.

Types of B. coli isolated from the droppings of crows.—In all instances *B. coli* has been found in 1 in a million dilution. Here I must apologise for the small number of samples I have examined, but I am continuing the work.

Total number of samples examined 5. Number belonging to the *Eischeria* group nil. Number belonging to the *Ærobacter* group 4; *A. aerogenes* 1, *A. cloacæ* 2, *A. levans* 1. Except for the reaction on adonite, *Ærobacter* 1 which cannot be identified.

Types isolated from the droppings of pigeons.—Four samples have been examined. Of these,

2 cannot be put into any of the species; Voges-Proskauer, methyl red, and Koser reactions all negative; with *Ærobacter levans* and *Ærobacter oxytocolum*.

It is interesting to note that the dangerous types of *B. coli*, i.e., *E. coli communis* have not been isolated from the filtered water supply, and the proportion of the less dangerous types—*E. communior*—is very small. About the *Ærobacter* group it will be seen that *A. cloacæ* is widely distributed not only in the filtered water supply but also in sewage and bird's droppings. I would like to point out some of the difficulties which I have met with. With the help of the broad synopsis of classification, i.e., by the Voges-Proskauer test, motility, and two or three sugars, one can put most of the *B. coli* into one or another type, but if one goes into the detailed sugar reactions, one comes to a deadlock. This of course is primarily due to want of using gelatine media, and secondly due to want of continued observation with a single sample of *B. coli*—e.g., reaction of milk, etc.

Here I give some particular samples which I have not been able to identify :—

I. Russa Road 23/7. 1 c.cm. +.

Voges-Proskauer, methyl red, Koser reactions —.
Sugars: MacConkey +, lactose +, glucose +, saccharose —, salicin —, dulcitol —, adonite —, inulin —.

Motility nil. Indol +.

The sugar reactions, Voges-Proskauer test, and indol reactions and non-motility all point to *E. vesiculosus*, but the negative methyl red test leaves one in some doubt as to whether to put it down as *E. vesiculosus* or some other unknown type of *Eischeria*. Formerly this organism would have been put down as *E. vesiculosus* as the result of the Voges-Proskauer test and sugar reactions.

II. Dum Dum Road. 1 c.cm. +.

Here the Voges-Proskauer, methyl red and Koser tests were all negative. MacConkey +.

Sugars: lactose +, glucose +, saccharose —, dulcitol —, adonite —. Motility nil, but salicin —.

Here the organism could be written down as *E. vesiculosus* but for the methyl red test and the salicin result.

III. Agam. some of the *Ærobacter* group, e.g., *A. cloacæ*. Here indol may or may not be formed, whilst certain sugars such as dulcitol and inulin, which are generally attacked, may be attacked. I have found a number of instances where indol has not been formed; also some fermenting neither dulcitol nor inulin, some fermenting both, some fermenting dulcitol only.

A. oxytocolum. I have found some strains fermenting all the sugars (lactose, glucose, saccharose, salicin, dulcitol, adonite) except inulin. Here the biological tests all point to *A. oxytocolum*, but the inulin reaction creates a difficulty. I have at least 4 such instances.

A. levans. One strain isolated from pigeon's droppings gave the following reactions:—Voges-Proskauer +, Koser +, methyl red —, lactose +, glucose +, saccharose —, salicin —, dulcitol —, adonite +. Motility +. Here everything points to *A. levans*, except for the adonite reaction.

IV. Some of the *Eischeria* or typical types. Two strains gave the following reactions:—Voges-Proskauer —, methyl red +, lactose +, glucose +,

saccharose —, salicin —, dulcitol —, but adonite +. Indol +. Non-motile. Here everything points to *B. acidilactici*, except the reaction with adonite. Here one may mention that some authorities recognise separate non-motile varieties of this type.

We may next deal with the metabolic properties :—

(a) *Indol reaction*.—This is tested for by the usual method with two reagents, viz., para-dimethyl-amidoazo-benzol aldehyde and a saturated solution of potassium persulphate on a three days' peptone water culture. The following were the findings.

Total number of <i>Eischeria</i> isolated	
with reaction +	24
Total number of <i>Eischeria</i> isolated	
with reaction —	0
Total number of <i>Ærobacter</i> isolated	
with reaction +	65
Total number of <i>Ærobacter</i> isolated	
with reaction —	28,

mostly *Ærobacter aerogenes* and *A. cloacæ*.

(b) *Nitrate reduction*.—We know that *B. coli* reduces nitrates to nitrites, the presence of which can be tested for by Hoesvay's reagent—solutions of sulphanilic acid and alpha naphthylamine. The organisms are grown in 0.1 per cent. nitrate broth for three days and then tested.

Results :—

Total number of typical <i>B. coli</i> with	
+ reaction	8
Total number of typical <i>B. coli</i> with	
— reaction	0
Total number of atypical <i>B. coli</i> with	
+ reaction	62
Total number of atypical <i>B. coli</i> with	
negative or doubtful reaction	1

(*B. cloacæ*).

(c) *Ammonia formation*.—It was found that certain strains evolve more ammonia than others. The reason for this however remains obscure. The intensity was judged from the degree of coloration with Nessler's solution. Almost all the samples—71 in all—gave a positive reaction. In only one instance was the reaction very slight or nil.

(d) *Catalase formation*.—This was judged by the evolution of gas with hydrogen peroxide on a 24 hours agar slope culture. All the samples, 70 in all, *Eischeria* or *Ærobacter*, gave a positive reaction.

(e) *Evolution of Sulphuretted Hydrogen*.—This was tested by growing the organisms on 0.1 per cent. lead acetate agar and noting the black and brownish-black colour. Here all the samples, 78 in all, gave a negative reaction except in only two instances where a brownish coloration was observed (these two belonging to genus *Ærobacter*).

(V). *Acid Agglutination*.—I have followed only the original method of Michaelis and

modifications by him. The principle has been that this agglutination is identical with the second phase of agglutination by an immune serum—namely flocculation of sensitized bacteria by an electrolyte, but occurs without any preliminary sensitisation, depending on the H-ion concentration. As a working hypothesis the view is that the positive charges borne by H ions neutralise the negative charges borne by the suspended bacteria and thus abolish the mutual repulsive character. (Solutions used—normal caustic soda and normal acetic acid in different proportions as given by Michaelis). As regards the value of this test, it seems to be of little value in identification. It has been stated that *B. coli* behave very indifferently but some strains of the bacilli behave like *B. typhosus* (that is flocculation in 3rd and 4th tube). My idea was to find out the proportion which behave like *B. typhosus*.

Results are given as follows:—

Total agglutinations performed—55 samples.

Total with agglutination positive with any of the six tubes—51.

Total with no flocculation in any of the tubes—4.

This flocculation occurs simultaneously in one or two or more tubes mainly in an irregular fashion but sometimes regularly.

Method of procedure.—A 24 hours agar culture of *B. coli* is emulsified in 20 c.cm. of distilled water. Of this 3 c.cm. is added to each of the six tubes. 1 c.cm. of each of the six solutions (or normal caustic soda and acetic acid in 6 different proportions) is added to the six tubes of bacterial emulsion and well mixed. A trace of serum is added to each of these tubes to hasten the process of flocculation. The tubes are incubated for two hours and then inspected. The proportion of agglutination in each of these six tubes are as follows:—

Tube No. 1	..	..	..	17
Tube No. 2	..	..	..	25
Tube No. 3	..	..	..	33
Tube No. 4	..	..	..	30
Tube No. 5	..	..	..	20
Tube No. 6	..	..	..	19

Instances in which flocculation occurred in regular fashion:—

Tubes 1, 2 and 3—10 instances.

Tubes 2, 3 and 4—4 instances (*B. typhosus*-like flocculation).

Tubes 3 and 4 or 3, 4 and 5—8 instances.

Tubes 4, 5 or 6—6 instances.

Tubes 5 and 6 or only 6—2 instances, and the rest were in irregular fashion. (Ref. *Medical Research Council*, 1920).

Salt action of B. coli.—One per cent. peptone water containing different salts in different molecular concentrations (as given by Wilson and Topley) was sterilised and then used. Here the same amount of bacteria is added to the different concentrations of the salts, and the sterility noted after 24 hours' incubation. At least 3 experiments were done with each

salt. Incubation was for 24 hours instead of 3 days.

Salts	No growth	Growth	REMARKS
CaCl ₂ ..	2 M 1 M	0.1 M	In one experiment growth in 1 M has been observed.
NH ₄ Cl ..	2 M	1 M 0.5 M	Topley 1 M; no growth.
KCl ..	3 M 2 M	1 M	....
BaCl ₂ ..	0.25 M	0.1 M	....
MgCl ₂ ..	1 M	0.25 M 0.5 M 0.75 M	Topley 0.5 M; no growth.
LiCl ..	0.75 M (in 2 instances) 1 M	0.75 M 0.5 M	Growth in 3 instances.
ZnCl ₂ ..	0.001 M	0.0005 M	Growth.

There has been some variation in my results from those obtained by Wilson and Topley, but this may be due to different strains of *B. coli* in Calcutta and the shorter period of incubation.

(VI). *Viability of the bacilli at different pH ranges.*—I used filtered water and distilled water and made them up to the required pH and autoclaved them before using. Here a definite amount of bacteria is added to each flask with a particular pH. The total count of bacteria is made on an agar plate immediately after inoculation, a control being made at the same time, and again after 24 hours' incubation total counts are again made on the agar plates.

The results with Calcutta tap water were as follows:—

pH range	Number of expt.	Total number of <i>B. coli</i> inoculated	Total number of <i>B. coli</i> isolated after 24 hours' incubation
pH 2.5	I	16 in 1 c.cm.	4 in 1 c.cm.
" 3.5	I	157 " " "	22 " " "
" 4.5	I	104 " " "	214 " " "
" "	II	84 " " "	190 " " "
" "	III	150 " " "	210 " " "
pH 5	I	98 " " "	Uncountable
" "	II	110 " " "	290 in 1 c.cm.
" "	III	23 " " "	126 " " "
" "	IV	110 " " "	Uncountable
pH 5.5	I	330 " " "	"
" "	II	180 " " "	"
pH 6	I	925 " " "	672 in 1 c.cm.
" "	II	48 " " "	280 " " "
" "	III	230 " " "	Uncountable
pH 6.5	I	179 " " "	"
" "	II	190 " " "	"
" "	III	65 " " "	681 in 1 c.cm.
pH 7	I	189 " " "	Uncountable
" "	II	120 " " "	"
pH 7.5	I	120 " " "	"
" "	II	125 " " "	229 in 1 c.cm.
pH 8	I	484 " " "	Uncountable
" "	II	281 " " "	442 in 1 c.cm.
pH 9	I	105 " " "	42 " " "
" "	II	210 " " "	35 " " "

So it is evident that *B. coli* has a wide range of viability and as stated by other authors that there is reduction of *B. coli* at a pH of less than 4.5 and at a pH above 8.5. If plotted as a curve, the curve remains low up to pH 4.5, then rises at pH 5 and 5.5, then slightly drops at pH 6, then rises again up to pH 8. From pH 8.5 the curve goes down to pH 9.

With distilled water:—The same amount of bacteria was added to each pH tube (0.1 c.cm. of a 24 hours' peptone culture). After incubation for 24 hours results were:—

Expt. I	pH 4.5	120
	5	110
	6	160
	7	210
	8	192
Expt. II	9	82
	4.5	82
	5	109
	6	130
	7	158
Expt. III	8	150
	9	70
	4.5	58
	5	90
	6	106
Expt. IV	7	132
	8	110
	9	94
	4.5	42
	5	70
	6	120
	7	Uncountable
	8	110
	9	68

It will be seen that the maximum number of viable *B. coli* in distilled water are obtained at pH 7 and pH 8, but there is always reduction at pH 9 and at pH 4.5. On the other hand, observations by Wilson and Topley give the maximum viability at pH 5 and pH 6.

Action of ordinary disinfectants on the strains of *B. coli* as isolated from the Calcutta filtered water supply:—

At least three experiments were carried out with each disinfectant. The sterility was tested after the required period of action. The same amount of bacteria was added to each dilution.

The value of potassium permanganate as a disinfectant on *B. coli* is practically nil.

The germicidal action of corrosive sublimate is quite good, as sterility has been obtained in 0.000001 grm. in 15 minutes only.

So this appears to be the best disinfectant for *B. coli*.

IV. Absolute alcohol.

As I do not know the 'thread' method which has been used by Minervini (1898), I made my dilutions as follows:—A definite quantity of water to give the required percentage of alcohol is sterilised and with sterilised pipettes definite amounts of alcohol are added to the bottles to produce the required percentages.

Disinfectant used	Dilution with sterile distilled water	TIME			
		10 mins.	1 hr.	3 hrs.	24 hrs.
I. Pot. permanganate ..	1 in 1,000	× +	× +	× +	—
Do ..	1 in 100,000	× +	× +	× +	—
Do ..	1 in 1,000,000	× +	× +	× +	× +
Do ..	1 in 10,000,000	× +	× +	× +	× +

× = +.

Disinfectant used	Dilution with sterile distilled water	TIME		
		15 mins.	1 hr.	24 hrs.
II. Corrosive sublimate ..	1 in 1,000	—	—	—
Do ..	1 in 100,000	—	—	—
Do ..	1 in 1,000,000	+	—	—
Do ..	1 in 10,000,000	+	—	—

Disinfectant used	Dilution with sterile distilled water	TIME		
		15 mins.	1 hr.	24 hrs.
III. Electrolytic chlorine ..	1 in 100	—	—	—
Do ..	1 in 100,000	—	—	—
Do ..	1 in 1,000,000	—	—	—
Do ..	1 in 10,000,000	+	—	—

The patient thereafter started to improve, and finally in October 1931 was discharged strong and fit, with no obstruction to the flow of urine.

We are indebted to the courtesy of Lieut.-Colonel W. T. McCowen, I.M.S., for permission to publish this case.

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'NOVASUROL' IN A CASE OF HEPATIC DROPSY

By D. N. PANDYA, L.M.P.

Thatheri Bazar, Benares

N. J., aged 65, Hindu male.

Previous history.—The patient was in the habit of taking wine. About a year ago the patient began to

markedly affected. The abdomen was tense and globular, and the girth of the abdomen was 39 inches; the calves were 13 inches. The liver was enlarged four finger-breadths below the costal margin. (It was not palpable on account of the dropsy and could only be palpated after the dropsy had disappeared). The scrotum was the size of a large-sized football, tense and shining, and the penis like an inflated bicycle tube. Pitting on pressure was present.

Treatment.—The usual diaphoretics and diuretics were tried, but with no success. Then the Novasurol injections were given, as follows:—20 c.cm. spread over a period of two months, from 22nd May, 1931, to 22nd July, 1931, on alternate days. Then the enlarged liver was palpated, and 6 grains of emetine were injected between 16th August, 1931, and 23rd August, 1931, on alternate days. About a month's treatment made him improve greatly; the dropsy disappeared, the liver began to diminish and the dimensions quoted above came down to 29 inches and 9 inches, respectively (*vide* photographs).

At this stage the patient discontinued treatment, and subsequently I heard that the patient was doing well. But exactly three months after I was called in again and then I found that his heart was in an alarming



Before treatment

suffer from frequent vomiting, loss of appetite, anorexia, giddiness and palpitation of the heart; together with these symptoms, he also noticed a slight swelling of the feet. This swelling gradually increased until it involved his hands, legs, and abdomen. So much so that he was unable to walk without the support of another person.

Present history.—In April 1930, having become alarmed and obtaining no relief from local treatment at Dakor, the patient came to Benares. Here he consulted some local vaid, hakeems and doctors, and he was told that he would not live for more than ten days. Finally, I too was consulted and advised Novasurol injections. At the time of my examination the heart was already



After treatment

condition. The patient died the same evening of heart failure.

I am not certain whether this effect on the heart was due to Novasurol given in excessive quantity or due to extraneous circumstances, *i.e.*, leading an unrestricted life as regards food, and living in a house where he had to ascend a very high staircase.

RENAL COLIC IN INFANTS

By PRAKASH KRISHNA ADYA, M.B., B.S.
Ratankuti, Ludhiana

A BABY, aged three months, was brought to me in a state of violent screaming. Taking it to be a case of

ordinary indigestion, which is so common in infants, I gave the child two drachms of castor oil. Next day the mother came with the report that the child became quiet after passing urine. I examined the child for phimosis which was not present. Then again after a fortnight the child was brought to me with such severe screaming that I considered the possibility of renal colic and I prescribed potassium citrate (grs. ii) and tincture of belladonna (m i) four times daily and ordered a hot hip bath immediately.

Then after about half an hour the child passed urine and became quiet. I examined the urine and there were uric acid crystals present. I prescribed urodonal for the baby. The mother reported later that now and then the baby cried a little on passing urine (which in my opinion was due to its passing gravel) and that once the baby passed a small calculus in urine.

I think renal colic should not be lost sight of when examining cases of screaming in infants.

AN INTERESTING CASE OF FIBRO-MYXOMA OF THE EPIPHARYNX*

By SUB-ASSISTANT SURGEON MATLOOB KHAN,
JEMADAR, I.M.D.

In-Charge Dispensary, Barsar, District Kangra

M. S., HINDU male, of Belaspur State, aged 27 years, of stout build, came for treatment for the following complaints on January 23rd, 1932:—

Bleating voice with difficulty in breathing for the last three months.

He gave no history of venereal disease and was unmarried.

Local condition.—Nose, outwardly no abnormality.

Inside of the right nostril an abnormal process was found occluding the whole right cavity; this slipped to and fro on the backward and forward movement of the head, and on pulling with a toothed forceps it appeared to be quite moveable and soft. A probe could hardly be passed to the back into the nasopharynx.

Inside the mouth, when widely opened, the right side of the soft palate was seen to be depressed and flattened, and there was a round tumour behind the uvula. On putting the curved index finger into the epipharynx on the right side, a lemon-sized growth was felt which was moveable and attached by a stem to the roof. The anterior process in the nostril was also moved on pulling the growth from behind. The growth could be pulled into the mouth in front of the uvula.

The patient was re-examined under cocaine anaesthesia and the pedicle was found to be attached to the body of the sphenoid.

The description of the operation for this condition in my surgery textbook alarmed me, as reference was made to the possible necessity of ligaturing the carotid artery and to the danger of cessation of breathing during the operation. Moreover, I had not all the instruments necessary for the operation described. The bloodless nature of the tissues and free movement of the tumour tempted me to perform the operation under some improvised means. It was my intention to pass a long-bladed artery forceps into the epipharynx from the front to meet the hooked index finger which had been passed *via* the mouth to touch the root of the growth, and under guidance of the finger hold it and then with a pair of curved scissors separate the tumour.

On the operation table cocaine anaesthesia was used, and when I passed my index finger into the epipharynx and pulled the growth with a little force the stem appeared to give way. I then boldly separated the growth with the finger as prostates are evacuated. At once the whole growth appeared in the throat and was removed.

The growth had three anterior processes, a posterior process, the size of a lemon, which had been lying in epipharynx, and a pedicle which had been attached to

the sphenoid bone. On histological examination it proved to be a fibro-myxoma.

After the operation there was a little bleeding which was stopped by an adrenalin pack introduced from the front to the epipharynx and kept in there for 24 hours; this was removed and replaced again for another 24 hours.

The patient was discharged cured on January 29th, 1932.

INVASION OF THE NASAL CAVITY BY A LEECH*

By SUB-ASSISTANT SURGEON MATLOOB KHAN,
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In-Charge Dispensary, Barsar, District Kangra

S. K., PATHAN, of Kabul, aged 35, whilst on a journey in the Agency Tracts, drank water from an earthen vessel and during the act of swallowing he felt something in the throat which he took to be some blades of grass. He tried to pull them out but could not do so. For 20 days he constantly felt a tickling painful sensation. He tried on several occasions to remove the obstruction, and his finger nails injured and caused ulceration in his throat.

Present condition.—The patient came from the throat; difficult and much so that water could not be drunk, and an uneasy sensation of tickling in the throat. The symptoms had become more pronounced during the last 4 days. There was headache on the right side and pain in the right cheek.

On examination.—The right side of the fauces was congested and the posterior pillar a little ulcerated in front.

The pain and mental anxiety was such that he had taken no water for two days. He was admitted to hospital. At night, two hours after admission, I was called as the foreign body was in the mouth. On examination with a light a leech was distinctly seen wriggling about in the throat. I tried to clamp it with a pair of artery forceps, but failed, as on the slightest touch it went back into the epipharynx.

A nasal injection of turpentine and chloroform was given, but as there was no satisfactory result in half an hour the artery forceps were left with the patient with directions how to use them.

During the night the leech was extracted by the patient with the forceps; it was a large one and lived for 24 hours after being extracted.

The patient drank water and milk freely and in the evening took solid food without any trouble. There was very little bleeding.

The interesting point in the case is that the leech stuck in the epipharynx during the act of drinking. There was no trouble, for many days except a little uneasiness and heaviness in the head. The patient only realized the existence of some living creature when he felt a wriggling sensation in the throat.

DELAYED BIRTH OF THE SECOND TWIN

By D. K. FAIRBAIRN

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THE patient, aged 35, fifth pregnancy, was admitted into hospital at 6 a.m. on the 22nd February, 1932, with a history of having given birth to a full-term female child on the 20th January 1932, at 12 noon, of subsequent complete cessation of uterine pains, and of the placenta being retained in the uterus.

On examination, a living female child was found to be attached to a long pulseless cord

* Rearranged by the Editor, I. M. G.

* Rearranged by the Editor, I. M. G.

which had not been separated. The cord was so long that the child had been breast-fed since birth.

The uterus was felt high up above the umbilicus suggesting that there was a second child inside the uterus. The foetal heart was heard and, on vaginal examination, the os was found fully dilated, the membranes entire and a shoulder presenting. A thick edge of the placenta was felt at one side—obviously the detached placenta belonging to the first child.

An injection of pituitrin, 1 c.cm., was given and the membranes were artificially ruptured; podalic version was done, and a live male child delivered quickly under chloroform. The placenta was expressed in due course and it was found that there were two separate placentae in two separate amniotic sacs, with a membranous partition between, and that the placenta of the first sac had been detached from the uterine wall for some time.

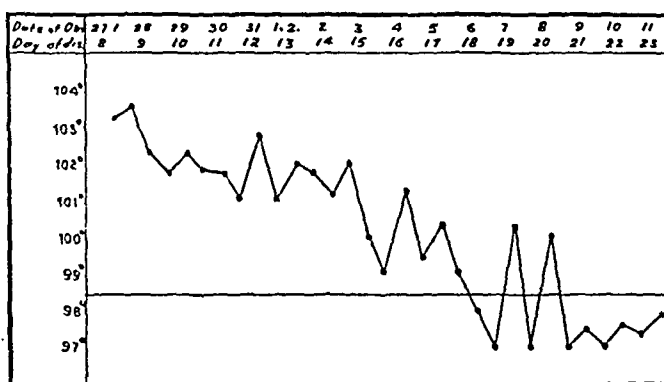
A CASE OF TYPHUS FEVER IN RANGOON

By M. L. KUNDU, M.B. (Cal.), F.R.F.P.S. (Glas.)
L.M. (Dub.)

General Hospital, Rangoon

K. M., Hindu male, aged 44, was admitted into the Rangoon General Hospital on the 27th January, 1932, with high fever of 7 days' duration. He is a clerk in a mercantile firm and the history was that he had had a dull headache on the day of onset, and that the fever shot up with a rigor and remained high on the successive days without a break. He had one or two more rigors during that period, and the visiting doctor, considering it to be malaria, gave him large doses of quinine without any appreciable effect. In fact his condition grew worse and he was removed to hospital. On admission his temperature was 103.4°F. and pulse rate was 128 per minute, flabby and irregular at times. He was delirious, and had a foul tongue, sordes were collected round the mouth and the conjunctivæ were congested. On examination a pink macular rash was found all over the back and on the extensor surfaces of the body and limbs; this rash was not very conspicuous on account of the patient's dark skin. The rash faded on pressure and disappeared in 4 days' time, without desquamation or pigmentation of the skin. The patient was profoundly ill, the abdomen was distended, he either passed urine in his bed-clothes or had to be catheterized on account of retention, and the bowels had to be moved with enemata. On the 17th day the fever showed signs of breaking and the temperature remained normal on the 22nd day. His general and mental condition simultaneously improved until he made a good recovery. He complained of some transient pain in the right knee joint, but this soon disappeared and, except for extreme weakness in the lower limbs, he was unaffected by the

fever. The only complication was bronchitis in the second week; this soon cleared.



The comparative frequency of his pulse in relation to his temperature, the abrupt initial attack and the profound toxæmia so early as in the first week, together with the spots on the extensor surfaces of his body led me to think that the disease was not typhoid fever but something else, and when the Widal reaction was found negative and the leucocyte count as high as 12,000 per c.mm., I surmised that it was a case of typhus: though no such case had ever been reported from Burma. I therefore requested Major Malone, I.M.S., the pathologist, to have a Weil-Felix reaction done with X 19; the reaction was found to be positive at such a high dilution as 1 in 2,000, giving a partial reaction in a dilution of 1 in 6,000, and a slight reaction even in a dilution of 1 in 8,000. The controls were negative.

I made an investigation into the possible source of infection; there was no one with lice in the hair in the family, and the man being a city clerk had no occasion to go out in the jungle, where he might be attacked by ticks. The case is not clinically the tick typhus described by Major-General Megaw (1925). How the infection was borne to the patient, a city clerk in fairly sanitary surroundings, is unknown, but it may have been due to an undetected tick bite, as suggested by Sundar Rao (1929).

The occurrence of epidemics of tropical typhus in Malaya makes it quite possible that the infection may have been imported from there to Rangoon or Moulmein, both seaports, Burma being a contiguous country to Malaya with a good deal of intercommunication.

I surmise that in the near future more careful examination and specific serum tests will reveal more cases of this kind in the seaport towns of Burma.

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Indian Medical Gazette

JULY

CINCHONA POLICY

It is a little less than a year ago since we discussed the subject of cinchona policy in India, but we need make no excuse for referring again to this extremely important problem. The Royal Commission on Agriculture has already made recommendations, now the Drugs Enquiry Committee has added its recommendation, and pointed out the urgent need for the extension of cinchona planting and the adoption of a definite cinchona policy, the League of Nations has formed a Special Malaria Committee which is examining the problem from the world's—but certainly not especially from India's—aspect, and yet there appears to be little prospect of anything being done in the near future; those from whom we might expect assistance, whilst admitting the necessity for some action, are slow to move in the matter.

According to a recent report of the League of Nations' Malaria Committee the world's total annual production of cinchona bark is 11,666,000 kilogrammes; 10,000,000 of this comes from the Dutch East Indies and a little over half of the remainder from British India. These figures make it easy to understand how complete is Amsterdam's control of the cinchona trade of the world, but before condemning the Kinabureau as a soulless capitalist institution maintaining quinine at an artificially high price to the detriment of the poor ague-stricken peasant, it is necessary to pause and examine the other side of the picture. Less than a hundred years ago the world's supply of cinchona bark was obtained from South America—from the forests of Peru and Bolivia. The demand for the bark in those days was considerable and as there was no organized cultivation, traders merely collecting the bark without planting new trees, there was at that time a serious danger that the world supply would soon become exhausted. Both the British and the Dutch foresaw this possibility and each sent expeditions to South America to collect plants and seeds in order that they might commence the cultivation of the bark in British India and in Java, respectively. Material gain cannot be considered to have been the object of these expeditions, but rather the preservation for posterity of a drug which was at that time, and has remained so until a few years ago, the only remedy for malaria, a disease to which, it has been estimated, one-third of the human race are subject. For many years cinchona planting was nursed sedulously by the respective governments; no attempt was made to

maintain any monopoly, but on the contrary private planters were given every possible encouragement. One of the difficulties was the very small quinine yield of the species of plant which had been imported and which appeared to grow best; the turning point appears to have been the discovery by Charles Ledger, an Englishman, of a plant, subsequently known as *Cinchona ledgeriana*, which was capable of producing a yield of 13.5 per cent. of quinine, about 10 times as great as many of the barks hitherto used. The British Government refused to buy Ledger's seeds and he sold them to the Dutch Government. This and the fact that the soil and climate in Java are much more suitable than are those of any part of British India for the growth of *C. ledgeriana* have given the Java plantations the advantage over those in this country. The Dutch Government had a hard fight to establish the cinchona industry and even then its subsequent career has not been unchecked. In 1880 quinine sulphate could command £10 per pound, but by 1893 the price had fallen to about 14 shillings, despite the increasing demand. Production had outstripped the demand and the price had fallen below the cost of production. About this date Ceylon began to give up cinchona planting for the more remunerative tea planting, but the Dutch in Java held on through the bad years. The position was not helped by the quinine manufacturers who maintained a higher cost for the finished article than the cost of the bark justified, so that the malaria patient did not get the benefit of this low cost of the bark. This over-production of bark continued more or less until 1913, the year of the cinchona agreement; this agreement is said to have saved the cinchona industry. The Kinabureau administers this agreement and thus dictates the price of quinine. It is not any more justifiable to accuse the Kinabureau of being 'vampires living luxuriously at the expense of the red blood corpuscles of the millions of untreated malaria patients', than it is to abuse rice growers and rice merchants because there are many hungry people in the world. Cinchona planters and manufacturers have to live and we cannot expect them to be philanthropists. The question arises, Do the Kinabureau abuse their monopolistic powers? They claim that they do not, naturally. The price of quinine rose considerably during the war period, but after the war it fell and eventually in 1926 it was fixed at Rs. 18 a pound. This price was maintained for about five years. It might reasonably have been expected that with the general fall in the price of all commodities, the price of quinine could have been lowered, but actually the reverse has occurred and during the past year the price, as it affects us in India, has risen; this recent rise in the rupee price of quinine is of course due to the drop in the value of the rupee as compared with Dutch.

guilders. Although we cannot blame the Kinabureau for the fall in the exchange rate, we have, perhaps, a case against them for maintenance of the old price in the presence of changing world conditions. But again, as we do not know all the circumstances, we are not really in a position to judge them. It is quite obvious that they can be exonerated from gross profiteering. The manufacture of quinine in the Bengal factory costs Rs. 7-5-0 a pound; this is excluding administrative charges and interest on capital, and in the Madras factory it is much higher. Thus even allowing for the fact that in Java conditions are more favourable the profits are probably not as great as has been suggested by the critics of the Kinabureau. If they were to increase their output they could no doubt lower their price, but have they any guarantee that their increased output would be absorbed? The world requirements of quinine have been placed at a fantastically high figure, but the discrepancy between the real requirements and the actual demands is considerable. A million pounds is certainly the very least India could absorb in one year if her malaria sick were given adequate treatment, but the biggest annual consumption hitherto has been a little over 200,000 pounds and to-day it is considerably less than this figure. For this discrepancy between the requirements and the demand for quinine in India there are two main causes: firstly, prejudice, ignorance and apathy on the part of the patients, and, secondly, the high price of quinine. The first is by no means a negligible factor, as anyone who has undertaken the free distribution of quinine in a rural area will agree, though it is one which is usually ignored by the critics of the Government of India and the Kinabureau. This factor is especially important in the rural districts of India. If quinine were as cheap as sodium bicarbonate, its distribution to malaria sufferers would still present a problem—not an insoluble one, but one which would take a number of years to work out satisfactorily. It is not this aspect of the subject but the second factor, the price of quinine, with which we propose to deal here.

Here we are entirely helpless. Whether it was the dogged perseverance of the Dutch, or just the lucky chance that the soil of Java is more suitable than that of India, the fact remains that in quinine production the Dutch have won the first round. India can produce at the most 70,000 lbs. of quinine a year and for the rest it must go to Java and pay Java's price. The obvious answer is for India to extend her cinchona plantations and produce more quinine. Here are difficulties; the areas suitable for growing the best quinine-producing bark, *C. ledgeriana*, are limited and have practically all been absorbed already, and, as we have said before, the cost of India-produced quinine is almost as high as that of the

purchased product, so that the problem cannot be solved that way.

It has been shown that not only quinine but the other alkaloids of cinchona bark are efficacious in the treatment of malaria. Hitherto the main demand has been for quinine and not for the other alkaloids; efforts have been concentrated on the growing of bark with a high quinine content, but *C. ledgeriana*, the plant with the high quinine content, does not grow as well as do other varieties in which the total alkaloidal content is almost as high, but in which the proportion of quinine is lower; the latter not only grow well in India but they grow under a wider range of climatic conditions so that plantation areas could be extended. To separate all the alkaloids and then to mix them in a definite proportion costs far more than separating them as a whole. This is no new idea, it will be said. Cinchona febrifuge has been manufactured and used in India for a number of years. In some provinces, Bengal for instance, it has been used extensively, but generally speaking it has never become very popular and the supply still exceeds the demand, as shown in the last report of the Bengal cinchona plantations. The reason for this failure to gain popularity, despite its lower price, is not difficult to find. Hitherto no serious attempt has been made to standardize cinchona febrifuge. It should contain the total crystallizable alkaloids of the bark, but the name 'cinchona febrifuge' is also applied to a mixture of the total alkaloids from which the quinine has been separated, that is to say, the alkaloidal residue; clinically this does not give such satisfactory results. Even when the total alkaloids are used, there will naturally be some variation in composition as the proportions of the different alkaloids vary. Here the advice of the quinologist is required. We want to know how far standardization, within a reasonable degree of accuracy, is possible by using one kind of bark or by judicious blending of the products of different barks without increasing the cost. The quinologist will naturally want to know what are the limits within which he must maintain his mixture. What is to be the minimum percentage of quinine and the maximum percentage of any other constituents, such as cinchonine, which sometimes gives rise to vomiting if present in excess, and the amorphous alkaloids, which are apparently more or less inactive, and which tend to make the mixture disagreeable and the tablets hard and insoluble? Nobody can give him a definite answer to these questions. Whenever the question is raised the only reply that can be elicited is, 'We thought that it had already been decided that all the alkaloids of cinchona were efficacious in the treatment of malaria'. But has it? And, if so, why do medical officers still talk as if quinine were the only alkaloid of value in malaria, and why do the majority

of provinces only use this expensive alkaloid in their hospitals and dispensaries? What is required is some clear authoritative statement on the subject. If this cannot be made on the work already done, then more work must be done and that immediately. The average practitioner in India looks upon cinchona febrifuge as a cheap but nasty substitute for quinine, good enough for dispensary patients. One cannot blame him. His prejudice is partly founded on past experience with inferior brands of cinchona febrifuge. Even after a satisfactory standardized febrifuge is produced it will be some time before this prejudice is broken down and it will require the united support of all those to whom the practitioner looks for guidance.

Another excuse for inaction in India has been the fact that the League of Nations' special malaria committee is at present engaged on the problem of producing a standard for the preparation of a suitable cinchona mixture. This never appealed to us as a good excuse; it was on the contrary a strong reason for reciprocal action in this country. But it is now more than a year ago since the committee decided on their standard, and has there been any sequel in India? Have the Government cinchona factories prepared Totaquina—the name given to the mixture which conforms to the League's standards—and have any clinical trials been carried out? Do we know whether Totaquina can be prepared from the bark of *C. succirubra*, as grown in India, without the addition of quinine to bring it up to the standard, or whether in the manufacture the residue can be reduced to the necessary minimum at a reasonable cost?

We can give tentative answers to these questions from the data we have before us. Totaquina is to be a preparation containing the total alkaloids of cinchona bark; it must contain at least 70 per cent. crystalline alkaloids of which 15 per cent. must be quinine, it must contain a maximum of not more than 20 per cent. amorphous alkaloids, 5 per cent. mineral matter and 5 per cent. water. If a bark does not contain quinine in this percentage then pure quinine must be added to bring it up to the standard. From the available figures, it would appear that there should be no difficulty in making a preparation of these standard requirements from most of the bark grown in this country, without the addition of quinine and without any special refinements in the manufacture; some of the cinchona febrifuges prepared from Indian bark hitherto appear to conform to the Totaquina standard. A mixed sample of the root, stem and branch bark of *Cinchona succirubra* will produce an alkaloidal mixture of the following proportions:—quinine—25.8 per cent., cinchonidine—20.0 per cent., quinidine—4.5 per cent., cinchonine—32.0 per cent., and amorphous alkaloids—17.7 per cent.

Again, from clinical experience at the Calcutta School of Tropical Medicine, in Bengal generally, and from that of Sinton at Kasauli, there seems little reason to doubt that a mixture of this nature will prove satisfactory in the treatment of the malaria encountered in India. These are the best answers we can give, but what is required before headway can be made is an *authoritative pronouncement* on the subject, and there does not seem to be any sign that one is forthcoming.

If a definite policy could be formulated everyone could work to that policy. At present the patient is suspicious, the practitioner is uncertain, the quinine manufacturer hesitates to make more cinchona febrifuge when he cannot get rid of what he has in stock, and the cinchona planter does not know whether to put down *ledgeriana* or *succirubra*. If Totaquina is as efficacious as the pure alkaloid, then every hospital and dispensary in India should be supplied with Totaquina only, government factories should make Totaquina only, and *C. succirubra* only should be planted. To ensure India's continued independence, cinchona plantations would have to be extended, but this should present few difficulties if the hardy *succirubra* is to be the plant grown. Given a cheaper drug, the provinces could then develop their distribution policy. At present with quinine at Rs. 21 a pound and money very scarce, they cannot hope even to continue their present schemes, but with Totaquina at, say, Rs. 4 per pound—not an unreasonably low figure to hope for—real progress could be made. As pointed out by the Drugs Enquiry Committee one of the most serious sequelæ of the high price of quinine is the wholesale adulteration that is adopted. They consider that legislation alone would not stop this whilst it is so profitable a practice, but that with a reduction in the price of the drug the incentive to this form of dishonesty would disappear.

If a definite policy were adopted we could very soon be entirely independent of both Java quinine and Java bark, and India would be able to claim a victory in the second round of the contest.

We do not imagine that this policy would please Java, as India has been a good customer in the past, and we have no doubt that the Dutch would not take defeat lying down. However, once the cinchona policy is adopted there should be no turning back; a reduction in the price of quinine—or of Java-made Totaquina—to rival that of the indigenous product would be a bait that should be treated with the utmost suspicion, and a little temporary self-denial would have to be exercised to avoid submission at a later date to the Kinabureau's monopoly. We have said that there is *no* reason to abuse the Kinabureau, but there is *no* need to be sentimental about them, and if

the policy is adopted we should be prepared to close our doors for ever on Dutch quinine.

During the last few years a new bogey has appeared—the synthetic antimalarial preparations. Plasmochin created a flutter in Java until it was realized that it was not a rival to cinchona but was rather an adjuvant in the treatment of malaria; now atebirin has made its debut and has shown promise of being an antimalarial drug as powerful as quinine and lacking many of the disadvantages of the natural alkaloid. At present, however, its price puts it entirely out of court for mass employment in India. To defer the adoption of a policy because of the fear that something new may crop up and replace cinchona in the treatment of malaria is surely the most futile of excuses. One might as well postpone the building of a bridge because next year a new kind of steel or a new method of bridge-building might be invented. Cinchona has a three-hundred-year-old reputation as a specific for malaria, and the introduction of a new specific, even though it be more powerful, is unlikely to displace it. Even supposing that atebirin could be produced at a price to compete with that of quinine, to give up cinchona planting on that account would simply be exchanging the domination of Java for that of Leverkusen.

Lest, by omitting mention of the large stocks of quinine which the Government of India have in hand, we be accused of having conveniently forgotten this embarrassing factor, we will say that, if this stock of quinine is to stand between the Government of India and the adoption of a cinchona policy which will ensure for ever India's independence in this respect and eventually bring about a revolution in the health of her people, we do not believe that the Government will be influenced by such petty monetary considerations, and, if only the financial authorities can be brought to a reasonable point of view, we see in this same quinine stock material for carrying us over the years whilst the cinchona policy develops.

Back Numbers Wanted

Dr. Harvey Sutton, O.B.E., M.D., Director of the School of Public Health and Tropical Medicine, The University, Sydney, N. S. Wales, is anxious to secure the issues of the *Indian Medical Gazette* for the months of April, May and June, 1931. Unfortunately no spare copies are available in the publishers' or editor's office.

Would any of our readers who has these three issues to spare please write direct to Dr. Harvey Sutton?

Medical News

THE INDIAN SCIENCE CONGRESS, 1933

The twentieth Annual Meeting of the Indian Science Congress will be held at Patna from the 2nd to the

7th January, 1933. Lieutenant-Colonel A. D. Stewart, I.M.S., Director, All-India Institute of Hygiene and Public Health, Calcutta, has been appointed President of the Section of Medical and Veterinary Research.

In view of the fact that a very large number of papers have been received in past years, making it impossible to read all of them in the time available, and necessitating the curtailment of discussion on others, the Sectional Committees have been advised to make a careful selection of papers accepted. Authors are requested to take note of the following points:—

(1) Papers on Medical and Veterinary Research must be received by the Sectional President, Lieutenant-Colonel A. D. Stewart, I.M.S., All-India Institute of Hygiene and Public Health, 21, Chittaranjan Avenue, Calcutta, not later than the 1st October, 1932, which is the last date for accepting papers, according to the rules.

(2) Only original papers, that is to say, papers which have not already been read or published in the same or similar form, will be accepted.

(3) Not more than two papers will be accepted from any one contributor.

(4) Papers must not take more than 20 minutes to be read. It takes 3 minutes to read a page of foolscap intelligibly, apart from diagrams, slides, etc. Papers should not, therefore, exceed 7 pages of typed foolscap.

(5) Papers must be accompanied by 3 typed copies of an abstract of the paper. This abstract must not exceed 200 words, and should not contain any formulae or diagrams. Papers not accompanied by such abstracts will not be accepted. It is not fair to members of the Congress not to have due notice from the programme of what a paper is about.

(6) All diagrams, tables, pictures, etc., should be reduced to lantern slides, or enlarged to posters corresponding in type to 6/18 Snellen.

(7) Authors should not contribute accounts of their papers to the local lay press. It is hoped that it will be possible to arrange for a daily précis of the proceedings in the Medical and Veterinary Section to be sent to the press officially by the President of the Section.

(8) Workers in Bengal and neighbouring provinces are requested to send their papers before the 21st September, 1932. The attention of workers is drawn to the resolution of the Executive Committees that abstracts of papers submitted after the last date, i.e., 1st October, 1932, shall on no account be printed in the advance copy of abstracts.

(9) Papers will not be accepted from individuals who have not paid their subscription for membership. Forms of application for membership can be obtained from the General Secretary, Asiatic Society of Bengal, 1, Park Street, Calcutta.

Will our readers kindly take this notification as the first official intimation with regard to the 1933 Congress? We trust, further, that the members of the medical and veterinary professions in Patna will co-operate to make the 1933 Congress a successful one.

There are three classes of members of the Indian Science Congress, viz:—

(a) Full members; annual subscription, Rs. 10.

(b) Associate members; annual subscription, Rs. 5.

(c) Student members (who must be certified by the principal of their college to be such), Rs. 2.

Only full members have the right to read papers. Associate and student members may submit papers through a full member. Subscriptions should be paid to the Hon. Treasurer, Indian Science Congress, c/o the Asiatic Society of Bengal, 1, Park Street, Calcutta.

THE INTERNATIONAL HOSPITAL ASSOCIATION

We have been asked to announce that a Post-Graduate Course in Hospital Technique under the auspices of the International Hospital Association will be held in Frankfurt am Main from the 29th September to the 8th October, 1932, inclusive. The headquarters for the course will be the Municipal and University Hospital, Frankfurt a. M. The enrolment fees

are 30 marks for the full course, or 5 marks per single day. Applications for enrolment should be made, if possible, before the 1st July, 1932, to Geheimrat Dr. Alter, 5, Moorenstrasse, Dusseldorf, Germany. The Municipal Hospital undertakes to find accommodation for persons attending the course. The course will consist of lectures, demonstrations, visits and discussions. These will be conducted by a large international staff of professors. The following is an abbreviated statement of the programme:—

Thursday, 29th Sept. Hospital lighting, and ventilation, sterilisation and disinfection.

Friday, 30th Sept. The recruiting of nursing staff, and examinations in connections therewith.

Saturday, 1st Oct. Standardisation of hospital administration, and supervision of general internal management.

Sunday, 2nd Oct. Visits.

Monday, 3rd Oct. Physiotherapy.

Tuesday, 4th Oct. The feeding of patients and the carrying of meals in hospital. With practical demonstrations in hospital cooking.

Wednesday, 5th Oct. Linen, laundry, and infected linen.

Thursday, 6th Oct. X-rays and radium in the hospital.

Friday, 7th Oct. Errors in hospital construction.

Saturday, 8th Oct. The preventive function of the hospital.

THE GARTON PRIZE, 1931

We have been asked by the British Empire Cancer Campaign to publish the following notice with regard to the Garton Prize and Medal for 1931:—

"The Grand Council of the British Empire Cancer Campaign begs to announce that, in accordance with the Rules and Regulations, the 1931 Garton Prize and Medal will not be awarded as, in the opinion of the Judges appointed by it, none of the essays that dealt with the set subject—'The Early Diagnosis of Cancer'—was of sufficient merit".

INDIAN MEDICAL BIRTHDAY HONOURS, 1932

The following are the names of medical persons and others associated with medical institutions in the Indian Honours List of date 3rd June, 1932. We would offer them our congratulations.

Knighthood

Colonel R. A. Needham, I.M.S. (Retd.).

C. S. I.

Lieutenant-Colonel F. P. Mackie, O.B.E., I.M.S., Director, Pasteur Institute, Shillong.

C. I. E.

Mr. D. H. Mehta, Retired Sanitary Commissioner of Baroda State.

O. B. E.

Mr. M. Keshava Pai, Director, Tuberculosis Institute, Madras.

Mr. Balwantsingh Puri, Red Cross Society.

Major D. R. Thomas, I.M.S., Chemical Examiner to Punjab Government.

Kaiser-I-Hind Gold Medal

Mrs. Beadon, Principal, Lady Hardinge Medical College, Delhi.

Miss H. M. Franklin, Medical Superintendent, Lady Reading Hospital, Simla.

Mr. A. H. Henderson, Medical Missionary, American Baptist Mission, Taunggyi, Burma.

Mr. C. E. Vail, Surgeon and Physician, American Presbyterian Mission Hospital, Miraj, Bombay.

Kaiser-I-Hind Gold Medal (Bar)

Rai Bahadur Lala Mathra Das, Honorary Surgeon to His Excellency the Viceroy.

Dr. E. Muir, School of Tropical Medicine and Hygiene, Calcutta.

Rai Bahadur

Babu Raghunandan Lal, Radiologist, King George's Hospital, Lucknow.

Rai Sahib

Babu Saurindra Nath Chatarji, medical practitioner, Singur, Hooghly, Bengal.

Khan Sahib

Manbri Mashudal Hossain, Bengal Medical Service (Upper Grade), Assistant Surgeon in charge Buxa Detention Camp.

Current Topics

Observations on the Use of Nembutal and Chloral in Childbirth

By JAMES VINCENT O'SULLIVAN, M.D., N.U.I.
M.R.C.P. (Lond.), F.R.C.S. (Eng.)

(Abstracted from the *Lancet*, 16th January, 1932, p. 119)

Nembutal is a recently introduced barbituric acid derivative (sodium-ethyl-methyl-butyl barbiturate) which hydrolyses on keeping, and is therefore put up in gelatin-coated capsules (grs. 1½ in each). It has the characteristic hypnotic properties of barbiturates though, as *nembutal* is rapidly excreted, the sleep is shorter than that produced by many others. Recovery from the drug takes place in about four hours. *Nembutal* is said to cause restlessness less often than other barbiturates.

Chloral hydrate is well known as a hypnotic. We gave it in grs. 30 doses in 3 oz. of freshly-prepared home-made lemonade sweetened with three to four teaspoonfuls of sugar. This was necessary to overcome the bitter and unpalatable taste of the drug.

METHOD OF ADMINISTRATION

Selection of cases.—In our series of 60 consecutive cases we found no contra-indications. The combination of *nembutal* and *chloral* was given successfully in cases of test labour and in cases complicated by heart disease and albuminuria.

Environment.—Routine examination of the patient should precede the administration of the drug. The room should be dimly lighted and quiet. A nurse should be in constant attendance, although many of our patients were left unattended from periods varying from 15 to 30 minutes.

Time of administration.—The initial dose should be given to a primipara when the os uteri is two-fifths to three-fifths dilated and pains are occurring regularly; and to a multipara when the os is one-fifth to two-fifths dilated and regular pains are present. The drugs are to be given by the mouth only. A total dose of *nembutal* grs. 7½ and *chloral hydrate* grs. 120 should not be exceeded in 12 hours. This total is reached by repeated single doses as follows: an initial dose of *nembutal* grs. 3 and *chloral hydrate* grs. 30; subsequent doses of *nembutal* grs. 1½ and *chloral hydrate* grs. 30. These drugs are not given simultaneously. The *nembutal* should always precede the *chloral* by ten minutes, because a lesser interval may excite vomiting. The first 'repeat' dose is given two hours after the initial dose. Subsequent doses are given every three hours. The interval between doses should never exceed four hours; for when this period is exceeded amnesia is never complete.

Heart cases.—In heart cases to prevent the possibility of restlessness we advise that morphia gr. 1/8 be given hypodermically with the initial dose. The dose of morphia should not be repeated.

DIFFICULTIES

The initial difficulties we met with may be described under the headings of dosage, vomiting, restlessness, and precautions.

Dosage.—As we did not know the power of the drugs and feared the effects on the mother and foetus, we began by administering small amounts (an initial dose of nembutal grs. 1½ and chloral grs. 15) and incomplete amnesia resulted. Subsequently we increased the initial dose to nembutal grs. 4½ and chloral grs. 30, but found that this diminished the force and frequency of the uterine contractions. By experiment we found that the best initial dose was nembutal grs. 3 and chloral grs. 30. Too early administration tends to slow down labour. Labour actually came to a complete standstill for 24 hours in a primipara to whom the drugs had been given as soon as pains had begun. Too late administration—e.g., an hour and a half before delivery—did not give the drugs time to act fully, and the four cases classified as failures come under this heading. The time interval between doses also had to be found. Our aim was to produce a continuous amnesia. With the doses given as above we found that if the interval exceeded four hours, interruption of amnesia resulted. The best interval for the first 'repeat' dose was found by experiment to be two hours; for subsequent doses every three hours.

Vomiting occurred in our early cases and immediately followed the ingestion of the drugs. There was no vomiting when nembutal was taken alone, and it was prevented, firstly, by giving the drugs separately (eventually we found that a ten-minute interval sufficed) and, secondly, by giving the chloral in smaller bulk, making it more palatable and causing the patient to sip it slowly.

Restlessness was noted in varying degrees in 12 of our 60 cases. In ten the restlessness was slight. In two it was severe. One of these was a case of heart disease, in the other labour was normal. No patient became maniacal. Restlessness developed, either shortly after the administration before the full effects of the drugs had been established, or during the stages of recovery from the effects of the drug, if the patient was still in strong labour. In the former group no prevention was necessary as the excitement was always slight. In the latter group, if early in the second stage, the drugs were repeated in the doses recommended, or, if the head was crowning, a few whiffs of chloroform from a Junker's inhaler were given. Morphia gr. 1/12 to 1/6 was given in ten cases. Three of these were cases of heart disease, and it was given to prevent possible restlessness. In four it was given late in labour with the initial dose of nembutal and chloral. The remaining three were cases of prolonged test labour. Of the ten labours five were painless. In no case did restlessness occur after labour was completed.

Precautions.—No precautions were taken in our cases to exclude external sensory impulses. As a general rule the ward was not darkened, nor were the patients isolated apart from a screen around the bed. This procedure was unavoidable because of restricted accommodation. The labour ward was, of course, kept as quiet as possible, but this was difficult, because on many occasions two or three patients were in labour at the same time.

CLINICAL EFFECTS OF THE DRUGS

The first effect of the drugs was a sensation of drowsiness which was followed by sleep. All the patients slept for varying periods after taking the drugs. Some awakened with the pains whilst others were only roused, and a few did not even move with the pains. Some patients were roused easily and could be made to talk and answer simple questions rationally though slowly. These patients usually had 'islands of memory'. Other patients were roused with difficulty, would answer questions very slowly, and then drop back to sleep whilst being questioned. A third group (two cases) could not be roused to answer any questions. These last two groups had no islands of memory. Only four patients

were noisy and then only with the pains. Most patients slept for times varying from one to eight hours after delivery and awakened fresh and well. Respiration did not change in rate or depth. There was only one case of slight cyanosis, the cause of which we could not discover.

Cardiovascular system.—The pulse-rate did not alter. The blood pressure showed only slight variations between 5 and 10 mm. except in one case where it fell 25 mm. In this case the fall took place 15 minutes after the administration of the drug. The patient showed no signs of collapse or distress, and in an hour the pressure had regained its normal height.

Urinary system.—We had no case of retention or any other urinary trouble. This contrasts favourably with the morphia and scopolamine narcosis in which there is a tendency to retention.

Alimentary system.—The patients had no trouble with their bowels, and did not vomit at any time after delivery, nor had they any digestive upsets during the puerperium.

Central nervous system.—The pupils usually remained moderately dilated and reacted to light and accommodation. The conjunctival reflex was absent in several of our patients, and in two the corneal reflex was also absent. In four cases the patient had coarse nystagmoid movements on lateral fixation the following day, but these passed off within 12 hours. One patient had double vision for five hours. There were no other ocular disturbances. The tendon reflexes varied. In most cases they were unaltered, in some cases they were slightly increased or diminished, and in two cases they were absent. All reflexes returned when the patient awakened after delivery. Muscle tone, as a rule, was not interfered with, but in two cases the limb muscles were flaccid.

EFFECTS ON LABOUR

First stage.—In 60 per cent. of our cases there was no lengthening of this stage. In the remaining 40 per cent. it was slightly prolonged but never excessively. It is interesting to note that in three cases of primary uterine inertia the pains were definitely stimulated in force and frequency after the drugs were administered.

Second stage.—In 50 per cent. of our cases there was no apparent lengthening of this stage. Labour advanced normally and the patient was able to bear down with the pains. In the other 50 per cent. there was a slight lengthening, and the bearing-down efforts were impaired. The average time of the second stage in the primipara was 2 hours and 36 minutes, in the multipara 1 hour and 30 minutes. In 20 cases we gave chloroform only with the crowning of the head. Of these 20 cases 13 were painless labours. Chloroform can be given by Junker's inhaler (the method we used), by the drop method, or in ampoules. From an analysis of our cases we note that forceps delivery was used in ten (one multipara and nine primiparae). In two of these cases the use of forceps was indicated because the patients had rheumatic valvular disease of the heart, and in three others to terminate test labours, one of which we shall describe below (Case 3). In the remaining five cases forceps were applied for delay in the second stage, two of these being for unrotated posterior positions. A general anaesthetic of either gas-and-oxygen or ether was given in all ten cases. Pituitrin was given in two cases where the head was delayed at the vulva.

During the last two and a half years the forceps rate at the London Hospital was 13.4 per cent. In our 60 cases it was 16.6 per cent.

Third stage.—There was no prolongation, the average time being 17 minutes. In 54 cases the placenta was expelled spontaneously or expressed from the vagina without any excessive bleeding. Post-partum hæmorrhage occurred in six cases. Five of these were mild (average loss 15 to 20 oz.), one was severe (loss 30 to 40 oz.). Of the five mild cases three were immediate, two were delayed. In the two delayed cases the hæmorrhage occurred two to three hours after delivery. All the mild cases were controlled by fundal pressure

and an injection of pituitrin and ergot. In the severe case there was a bicornuate uterus and a bipartite placenta which separated incompletely, one part remaining in the uterus and the other in the vagina.

EFFECTS ON THE FETUS AND PUERPERIUM

We have given nembutal and chloral in 60 cases, many of them difficult labours, and in no case have we had a dead child. The babies in all but six cases were born healthy and of good colour, and cried lustily. Four of these six infants were born in apnoea and two in white asphyxia. The latter two were born in test labours. Two of the former had morphia. In all of these cases regular breathing was established within ten minutes.

The puerperium was normal in all but one case in which parametritis occurred. The milk flow was never disturbed and the babies thrived during their stay in hospital.

RESULTS

The standard by which we determined our results was based on the statements made by the patients when questioned on the day after labour. These results were as follows:—

(a) Painless labour	..	37 cases	62 per cent.
(b) Very good result	..	13 "	21 "
(c) Good result	..	6 "	10 "
(d) Failure	..	4 "	7 "
TOTAL	..	60 "	100 "

(a) Complete amnesia. (b) Very good results when the patient had vague recollection of a few incidents, such as the birth of the head. Many of these labours would undoubtedly have been completely painless if chloroform had been given during the birth of the head. (c) Good results, in which partial amnesia was present and when the intensity of the pains was diminished. (d) Failures, when the patient slept in the intervals between pains but remembered all her labour.

CONCLUSIONS

(1) In our opinion this combination of drugs is safe and can be given to any woman in labour. (2) The drugs are easily portable and are given without trouble to the attendant or discomfort to the patient. (3) Judging by our experience the drugs may be administered by midwives but they must follow the technique carefully and never vary it without the direct permission of a medical practitioner. (4) In our series of 60 consecutive cases we have had 62 per cent. of painless labours without any ill-effects to mothers or children.

Comments on Some Recent Excursions in Therapeutics

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I HAVE decided to touch upon one or two of the more recent tendencies which have shown themselves in the modern treatment of disease. Time permits of my mentioning only a few of these, and, even so, to take but a glance at them. But this glance is not without interest, especially for those of us who, with sadness be it said, can remember former things, and so take a wider view than might otherwise be possible of the transitions taking place in this as in other parts of medicine.

I have used the word 'excursion' in the title of these remarks because I want to convey the idea that, with our limited knowledge of the causes of disease, and of the interactions produced in the body by these causes and the defensive mechanisms that are present, the most that any generation can do in therapeutics is to make tentative inroads into these but partially unexplored regions, with the hope that some resultant

benefit may accrue to our patients. Sometimes these excursions are rational, sometimes they are empirical, sometimes they have the elements of great wisdom, and sometimes they are merely wild adventures. They are the result of a widely different series of impulses, which includes the knowledge accumulated by our predecessors, the discovery of new facts in physiology, the provision of new tools in chemistry, in physics, in mechanics, and indeed in all the sciences, the temperament of the doctor, and the tolerance and credulity of the patient. For I take catholicity to be the essence of our outlook in therapeutics, as it is in medicine generally. Unless, of course, we be nature curers, and do not believe in drugs; or spiritual healers, and do not believe in any material aids; or homœopaths, and slaves to a narrow therapeutic doctrine; or follow some peculiar vogue which, though it may tickle the popular imagination for a time, cannot bring to the service of the sick person what is surely his right to expect, the sum of all human knowledge that can possibly be used on his behalf. No, I assume that we regard medicine as the child of all the sciences, and of all the arts, and therapeutics as the practical issue of medicine, directed towards the maintenance of human health and happiness.

Therefore I omit from my survey this evening all these limited cults, by which therapeutics is 'cribb'd, cabined, and confined'. I also omit the various excursions that are from time to time made in that dim borderland which lies between a legitimate fostering of the patient's confidence—so valuable a therapeutic asset—and a gross exploitation of his fears and of his hopes. Among the 50,000 men and women who practise medicine in Great Britain there must needs be a few who have never quite mastered the spirit of the Hippocratic oath; nor of the Golden Rule. And there is that vexed question one is so often asked as to whether a man may, by frequently repeating it, become convinced of the truth of something which is so obviously a lie! And charity bids us say 'yes', though, when we see the fellow, and talk to him, the one thing certain is that he should never have been a doctor, but a politician! And so I omit Abram's Box, that nightmare which afflicted us a few years ago, and which I learn is still, like a rat in a hole, nibbling at the purse of that part of the public which thinks an instrument, however ill-constructed, is not likely to err like the fallible human brain. And I omit those electrotherapeutics that are peculiar in that 'no one has an installation like it'; and 'bloodless surgery'; and 'cheiropractics'; and the latest drug from Berlin, 'brought over on purpose'. And even the exploits of the foreign 'professors' who have a special attraction for many patients because, not being British, they are thought to hold the keys of heaven and of hell in matters hygienic. In most of these excursions we catch sight of the cloven hoof, though the victims themselves elect to charge us with jealousy and ostracism. Credulity, like youth, must be served, and where the carcase is there will the vultures be gathered together.

I will deal only with two interesting and important excursions, and offer some comments upon them. They are the development of irradiation therapy, and the present position with regard to immunotherapy.

X-RAYS AND RADIUM

The discovery of x-rays in 1895, and the isolation of the rarer metals—and especially of radium—and their radiations between 1896 and 1901, placed in our hands therapeutic instruments of enormous value. X-rays being first rendered available in practical fashion, their application in the treatment of disease preceded that of radium by several years, and until quite recently they constituted the more popular method of employing gamma rays therapeutically. Of late, however, the position has become reversed, so much so that in several fields there seems a tendency to discount the value of x-rays for purposes of treatment and to confine their usefulness to the field of diagnosis. This seems unfortunate seeing that, as it would appear, we had only

just begun to explore the possibilities of x-ray therapy at the time when radium therapy overtook the older method in popularity. It is only since the war that reliable and constant apparatus in x-ray work have been developed. Accurate dosimetry, and especially the co-relation between physically measured and biological dosage, are, again, of quite recent development; so also is the technique for depth irradiation. It is clear, therefore, that the stage has only been set within the last few years for really accurate observations of the therapeutic value of x-rays. A vast amount of ill-controlled work is being done in this sphere, and by practitioners who have not had the necessary training for the purpose. This cannot be in the public interest, and we welcome the institution of a diploma which, supposing it to be adequately safeguarded and of a high standard, will serve to guide the patient and his doctor in the direction of efficiency. As an example of inefficiency may be mentioned the treatment of carcinoma, other than surface lesions, by low voltages, the use of which, besides being ineffective, prejudices the approach for subsequent proper treatment. On the other hand, low voltages have their value in several other directions, and their limits of service, as in the case of high voltages, are still quite unknown.

In the case of radium, no less than in x-rays, the technique of administration demands whole-time service. So specialised, indeed, has the work become in the case of these two therapeutic measures that it seems impracticable for the same person any longer to engage in both with any degree of efficiency. Nor is it likely that, in the case of x-rays, the same person can, in the patient's best interest, undertake both their diagnostic and their therapeutic application.

The segregation of these two important methods of treatment must needs result in a certain lack of unanimity as to which of them is to be preferred in particular cases. The exponent of either method naturally tends to consider it the fitter of the two, since he gets better results with the familiar, than with the unfamiliar, technique. It therefore becomes a matter of considerable importance that the practitioner, who is directly responsible for the patient, should acquaint himself thoroughly with the possibilities of both methods, since his own judgment is likely to be called upon, more and more frequently, to decide which is the more likely to attain the result desired.

The recent boom in the treatment of inoperable—and in some instances of operable—neoplasms, led to a great demand for radium in this country. The demand was quickly met. It then became apparent that there were not enough trained workers to deal with the radium actually available, and we are to-day witnessing the anomaly of radium going abegging. This position will, however, adjust itself when, on the one hand, workers have become more expert and, on the other hand, when we have extended the list of diseases for which it is reasonable to try the remedy.

Meantime it is interesting to observe that a great deal more experience is required before even the experts are agreed as to the dosage, the frequency, and the field of irradiation, in the case both of radium and of x-rays, and even in diseases for which both have been used as a routine method of treatment for several years. A good example of this fact is seen in leukaemia: are the best results obtained from large doses given infrequently, or from small doses given frequently, and should it be the spleen, or the bones, or the glands, or some neutral part or parts, or several of these, that should form the field of irradiation?

SEROTHERAPY

In the treatment of microbic infections we have seen the swing of the pendulum more than once between bacteriotherapy and chemotherapy. The introduction of the method of passive immunity by means of antisera, and, later, of the method of active immunity by means of bacterial antigens, led to big hopes. In the latter instance, it must be admitted, it led to big business also. During 30 years' experience of these

methods there have been great disappointments, and yet, here and there, stimulating successes. In the case of serum therapy it is possible, by further research and trial along two directions, that some of the former hopes may be redeemed. (1) The first direction relates to the determination of different types of the infecting agent within a group, and the preparation of type-sera for use in homologous infections. Efforts have already been made along this line in the case of the pneumococcus and the meningococcus. In the even more important group of streptococci, though the difficulties are greater, a similar effort may yet be rewarded by good results. (2) In a second direction hope springs afresh. It has been held for a long time that the exotoxins produced during culture were not of service in the preparation of antisera in coccal infections. They were for the most part carefully separated off from the bodies of the cocci, which alone were used for the immunising inoculations. The resulting serum was therefore described as bactericidal or bacteriolytic. It has been found more recently, however, that a much more potent serum results from the use of these exotoxins together with the endotoxins. These newer exotoxin-sera are now on trial, and some of the results of their use, especially in acute and virulent infections by *Streptococcus pyogenes* (vel *haemolyticus*), have been strikingly good. These sera, having been chiefly obtained by the use of streptococci from the throat in severe cases of scarlet fever, have been somewhat unfortunately labelled 'scarlatinal anti-strep. sera'. They are, however, quite as useful in streptococcal infections other than in scarlet fever as they are in this disease itself.

VACCINES

The 'opsonic index' hypothesis gave a semblance of reasonableness to vaccine therapy without which the early hopes entertained on its behalf would probably have dwindled much earlier. Now that we must regard the method as entirely empirical the field is free for fuller exploitation, and that it has certainly had in no small measure. But though we have served out to the tissues of the infected patient specific antigen in divers ways—dead, living, 'detoxicated', sensitized'; as endoplasm, as ectoplasm; and by divers systems of dosage—minute doses frequently, a massive dose singly and by all gradations and with various intervals; the very cases of infection in which we most need help seem to elude all these processes. And yet it must be admitted that here and there the general methods at our disposal for combating pyogenic infection in individual cases seem to receive striking assistance from antigen therapy. To those of us who have formerly inclined strongly towards this method, consideration of the present position with regard to the treatment of such diseases as pulmonary tuberculosis, septic endocarditis, and staphylococcal pyemia, for example, must needs cause a feeling of discontent. For in all three of these diseases we rely to-day upon exactly those measures of a general, non-specific sort that we did a quarter of a century ago. But here again it would be foolish to suppose that we have seen the limits of the method of active immunisation. We may have missed the optimum possibilities of the method by just a little, and we may one day hit upon, or stumble upon, some modification of our present techniques which will make all the difference between the frequent failures which cause so many to be frank disbelievers to-day, and such uniformity of good results as will convince the most sceptical. The suggestion that better results might be obtained if we took pains to bring the antigen into more immediate and direct contact with the tissues which are the main site of infection is only now being followed up.

A new chapter has been opened quite recently in connection with bacteriophages. Concerning these, the work so far done, both in the laboratory and by the bedside, is too meagre to call for detailed comment.

CHEMOTHERAPY

Chemotherapy received a marked fillip with Ehrlich's introduction of 606. Within a few years there was scarcely any infection that had not been treated by the method. No doubt many lives were lost in consequence, though it is probably true to say that in most of these instances recovery would not have occurred had the remedy not been used. Today we do not regard the drug, nor its more modern equivalents, as being directly germicidal, as Ehrlich did, and we have found that its indirect germicidal effect is limited to a somewhat narrow field. We are also beginning to realize, having given up the ideal of a *therapia sterilans magna*, that the intravenous route is by no means necessary, and may at times be inferior to the older route of the muscles. But the success of 606 gave a general stimulus to the use of germicidal preparations in pyogenic infections. The use of perchloride of mercury was reintroduced, but its place was soon taken by less toxic mercurial compounds such as the salicylate, and especially mercurochrome. In this substance the coagulative property of mercurial salts is greatly reduced, whereas penetration is aided by the introduction of the aniline dye fluorescein. Though far from being an ideal blood antiseptic, it is perhaps the nearest approach to this that we at present possess. The most sensitive tissue which it meets in the course of its action is the kidney, and, since damage done to this organ is so apt to be permanent, the use of mercurochrome calls for the utmost care.

SPECIFICITY OF REMEDIES

Of late years we have seen a reaction against the doctrine of specificity in the therapeutics of microbial infections. This reaction has shown itself in the field of bacteriotherapy and also in the field of chemotherapy. We have seen the introduction of protein shock, and also of what not seldom—though this effect is perhaps not intended—results in chemical shock. Such treatments have their basis of reason in the hypothesis that the mechanism of immunity is generic rather than particular, and that it may therefore be activated by the same stimulus though the disease be caused by quite different species of infecting agents. Such a conception is fundamental, but the evidence supporting it is at present too slight to warrant its acceptance as a sound basis for a scheme of therapeutics in infective diseases generally. As usual, it may possibly be found that the truth lies somewhere between the two extremes, of specificity and non-specificity. The supposition, for example, that a dose of staphylococcal antigen may so jostle the immunity mechanism—evidently a very elaborate affair—as to leave the patient somewhat better when a state of relative equilibrium is once more established, and that this may happen even when the infection is bacillary in origin: such supposition is not incompatible with the view that an additional, and perhaps more valuable, benefit is derived from such administration in cases in which the infection is homologous with the particular antigen used, in this case staphylococcal. Even the idea of a 'provocative reaction' may not be so specific as is usually supposed. The danger lies in assuming a simple interaction, or a single one, or a direct one, when all the time it may be complex, multiple, and indirect. There can be no harm in exploiting these new remedies and these ideas to the full provided we keep an open mind as to the nature of the interaction, and, it may be added, provided we use forbearance in accepting the explanation that fits with our own preconceived ideas, and decline to consider other and alternative ideas.

But since we are dealing always with an organism which possesses defences of its own, it behoves us to be careful that our reputed remedies do not merely add to the load the patient has to carry, and thus put a drag upon his natural resistance to his disease. This is an age of hustle, and a lust for the royal road to recovery is everywhere apparent. We are prone to forget that, though we may hope to shorten the course

of an infection by our intervention, the chance of our being able to substitute an entirely different set of interactions from those by which the tissues reassert their criterion of health is remote. I do not myself find it difficult to visualize a remedial agent which shall expedite the natural course of recovery from an infection. There would often appear to be a lag in this natural process which, quite conceivably, might be overcome by appropriate means. But this raises the question as to whether the patient possesses a reserve in his immunity mechanism which can be called up for our purpose. And it may well be that this is a matter varying considerably in different individuals.

We get hints of this being actually so. Though, like many others of their terms, the words 'sthenic' and 'asthenic' used by our teachers of some thirty years ago, lacked clear definition, they undoubtedly correspond with observed clinical pictures. And, as one man's meat is another man's poison, so, I suggest, the contents of a hypodermic syringe that are found to be tolerated, or even appreciated, by one patient, may be definitely harmful to another, and yet both may be stricken by the same infection. That a dose of X.Y.Z 42 'will often enable an influenza patient to resume work on the third day' (I quote the advertisement) is not a controvertible statement, because a lot of other remedial measures have exactly the same to their credit; and provided the attack is quite a mild one, these measures may not have included any drugs whatever. But that (to quote again) 'there is definite clinical evidence that the effect of injecting X.Y.Z 42 in the early stages of influenza is to reduce by one-half the duration of the disease and its accompanying symptoms' is a matter which must be left to the members of this Society and other equally competent observers to decide, rather than to the makers of the drug.

Concerning another preparation which I will call Angelina (said to contain 'specific antibody', which is exactly what it does not contain) in the treatment of pneumonia we read—and the statement is italicised—that 'recovery begins on the first day'. The evidence given for this claim is that there is 'a fall in the temperature six hours after each injection'. But this, of course, is no necessary sign of betterment; it may be the converse. As to recovery beginning on the first day, it may be safely presumed that, in any infection, the patient begins to recover—or to die—on the first day. This is quite compatible with, indeed it is a direct inference from, all that we know about immunity.

The number of these substances that are to-day being used in combating infections is considerable, and increases almost weekly. They are for the most part complex bodies possessing very large molecules. Their use is by some based upon the hypothesis that the protective power of the plasma resides in a number of protein particles that circulate in this medium, and that these particles can be 'condensed' or 'dispersed' by the injection, intravenously or intramuscularly, of the chemical substances referred to. How much of this hypothesis is known, or understood, by the majority of those who employ these therapeutic agents is doubtful; perhaps such knowledge is not necessary; but the confidence of those of us who are as yet unconvinced of the efficacy of these remedies is not enhanced by the somewhat casual manner in which the typical devotee of this particular school speaks of his exploits: 'I plugged him with X.Y.Z'..... 'I fired in Angelina'.....

But given a little forbearance, and some common-sense, I think these remedies should by no means be condemned out of hand. What is more important, however, is that the physiologists should come to our rescue. Either there are particles in the blood plasma, or there are not; and, if there are, either they are 'condensed' and they are 'dispersed' by the injection of certain chemical substances, or they are not. I cannot find that anything is known with certainty about these fundamental things; and research into them seems urgently called for. At present the issue is confused, and perhaps the method is prejudiced, by the business

enterprise of the manufacturer and by the ease with which he converts the busier and less sceptical members of the profession. If the syndicates who run these things really want to establish their remedies, let them set aside some of the money they are making to biological research. At present their extravagant claims have far outrun the flimsy basis of fact upon which they are based.

PROGRESS OF THERAPEUTICS

Medicine has been termed an 'inexact science'. And by some confusion of thought this old saw has by many been considered to represent a permanent state of affairs. But much in medicine that was inexact yesterday is exact to-day, and much that is inexact to-day will doubtless be exact to-morrow. And it is but to change the words rather than the facts if we say that what is empirical to-day will become rational to-morrow. In many things therapeutics lags behind pathology, but pathology should always be prepared to get an inspiration from therapeutics. It is right, because it is useful, that therapeutics should continue to push out its antennæ, in this and in that direction, hoping to feel new facts that even pathology has not found. These, if found, should be explored by pathology, so that the remedy chosen might have the three time-honoured cardinal merits for which every patient rightly pleads—it should cure safely, pleasantly, and swiftly.

Resistant Sprue Anæmia Yielding to Intravenous Liver Extract

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THE patient, a European male, aged 47, has been under the care of one of us (L. R.) at the London Hospital for Tropical Diseases, at intervals since 1926, for relapsing sprue contracted originally in Burma in October 1923 and complicated by severe anæmia. At first he responded well to a milk diet and returned to Burma, only to come home again in 1925 with a recurrence of his sprue, with sore tongue, fatty stools, and anæmia. In 1926 he was again treated with milk diet (and was also given small doses of novarsenobillon, as a positive Wassermann reaction had been obtained), with good effect on the anæmia. In addition, he had injections of an autogenous oral streptococcal vaccine, which resulted in the clearing up of the soreness of his tongue. In December 1928 he was readmitted with severe anæmia; red blood cells 1,470,000, hæmoglobin 50 per cent., and colour index 1. A transfusion of 500 c.cm. citrated blood was given (causing rather a severe reaction), together with liquor arsenicalis orally, and a milk diet. Once more good results occurred, and the blood was restored to about normal. In July 1929 he was readmitted with sprue symptoms and moderate anæmia, and was treated with 1 lb. of liver extract and Fairley's high protein diet. By January 1929 he had gained a stone in weight, and his blood was practically normal again, but he relapsed once more in July 1930 to pick up yet again on liver extract and high protein diet. He continued taking one to three tubes of liver extract daily after leaving hospital, but had to be readmitted in February 1931 when the liver treatment failed to have as good an effect as previously.

On July 29th, 1931, he was again admitted to the hospital with severe anæmia, but freedom from the former sprue symptoms of diarrhœa and sore tongue. Red blood cells were 1,940,000, hæmoglobin 40 per cent., and colour index 1, and there were signs of megalocytic anæmia, including the presence of scanty normoblasts and of megalocytes. On admission, in view of the good effects of the previous blood transfusion, 600 c.cm. of

citrated blood were injected intravenously. This was followed by a temperature of 104°F. on the next day, accompanied by vomiting of bile-stained fluid, and the passage of dark urine. There was drowsiness for three days and slight jaundice, while at the same time the liver became somewhat enlarged and tender, the reaction being thus a severe one. Unfortunately, instead of the hoped-for improvement in the condition of his blood, it steadily deteriorated, until on September 1st it showed red blood cells 1,000,000 and hæmoglobin 20 per cent. His condition caused grave anxiety, for in the meantime both Parke, Davis & Co.'s ventriculin orally, and the same company's liver extract subcutaneously, had failed to check the downward course of the blood changes. We then decided to try hepatex P. A. F. intravenously.

RESULTS WITH HEPATEX

This new preparation, sold in 5 c.cm. doses containing the equivalent of 100 grams of fresh liver, is said to produce an immediate reticular response. To be on the safe side, a 2 c.cm. dose was injected intravenously on September 2nd without any undesirable symptoms. Five c.cm. was given by the same route on each of the next four days, making a total of 22 c.cm. in six days. After the third dose of 5 c.cm. the patient felt better, though he had a restless night. On the afternoon of the fourth injection he first complained of discomfort in the upper abdomen, which became acute after the fifth dose, and there was vomiting of undigested food in the evening. On this day the pain began a quarter of an hour after the injection, with discomfort in the right hypochondrium spreading to the epigastrium, becoming severe for five hours, and being unrelieved by hot fomentations. On the following morning the liver was found to be enlarged to below the ribs, and its edge was very tender. As the red corpuscles had already risen from 1,000,000 to 1,800,000, a 5 c.cm. dose of hepatex was given intramuscularly on September 7th, the injections being omitted on the 8th and 9th, as the severe abdominal pain had recurred and the sickness continued. On the morning of the 9th, the edge of the liver was felt two inches below the ribs, and there was a tender spot over the region of the pylorus. A bismuth meal was given, and a radiological examination of the stomach and duodenum carried out, with negative results. A rise of temperature accompanying the abdominal reaction on September 9th subsided the next day, so between that date and October 7th ten doses of 2.5 to 3 c.cm. of hepatex were administered intramuscularly every second or third day without any further untoward symptoms. On the 13th the Bland's pills, which had been omitted on the 8th, were recommenced.

The blood response was very satisfactory, for a rapid and steady rise took place in both the red corpuscles and the hæmoglobin, accompanied by a remarkable reticulate response up to 6.6 per cent. in three days, and up to 33 per cent. within six days of the commencement of intravenous hepatex. The red corpuscles and hæmoglobin rose from 1,000,000 and 19 per cent. on September 3rd, to 1,800,000 and 20 per cent. on the 7th; 2,660,000 and 41 per cent. on the 18th; 3,590,000 and 55 per cent. on the 29th; 4,020,000 and 64 per cent. on October 6th; and 5,060,000 and 84 per cent. on October 22nd, by which time the patient had been discharged from hospital. Two months later his blood condition was well maintained and the general health good, except for the return of occasional watery diarrhœa, which he believes followed the intramuscular injections of hepatex.

The main points of interest in the case are: first, the remarkable and rapid recovery, after intravenous hepatex, from a dangerous condition of post-sprue pernicious anæmia, which had failed to respond to ordinary methods of liver extract administration; secondly, the severe abdominal symptoms following a few intravenous injections, due to rapid enlargement of the liver, and sufficiently acute to raise the question of serious gastric or duodenal disease. These symptoms subsided when

the injections were made by the intramuscular, instead of the intravenous, route.

(Note:—A chart that showed graphically the steady rise in the hemoglobin and red cells, recorded above, appeared with the original paper but has not been reproduced here. An interesting feature of this chart was the rise in the reticulocyte count; this commenced during the first few days of the administration of hepalex and reached its highest point, 33 per cent., on the 6th day, rapidly falling to 10 per cent. within another few days, and reaching the normal line about three weeks later when the red blood count was still only 3,500,000 per cmm. This is the typical graph of the reticulocyte response after hepalex in pernicious anemia.—Elliott, L. M. G.).

The Baer Maggot Treatment of Osteomyelitis

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and

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Those who are in constant contact with chronic osteomyelitis realize that considerable advances have been made in recent years in the technic of handling the disease surgically. Nevertheless, many cases still fail to heal following the usual surgical procedures. The presence of many adult cases of long duration is sufficient testimony of a lack of perfection in treating this disease in childhood, when it usually makes its first appearance. Any new method, therefore, that may give promise of reducing the number of failures and lessening the time of healing is deserving of serious consideration.

The success or the failure of any form of treatment in this disease is influenced by several factors. The age of the patient and the duration of the disease are important. Osteomyelitis seems to heal most readily in very young patients. When the lesion has been present for many years, the chance for success with any method of treatment is greatly lessened. The adult cases usually represent a continuation of the infection from younger days or a recurrence from an old lesion. In these cases there are pathologic changes, which tend to interfere with healing. The development of dense, eburnated bone, with a very poor blood supply and tissue low in healing power, creates a condition difficult to correct. There is also dense fibrosis of the surrounding soft tissues which presents a difficulty in the matter of permanent closure without breakdown and sinus formation. The real problem presented by these cases is that of securing adequate treatment in earlier years before this tertiary condition has had time to develop. The approach to this problem must be along the lines of preventive rather than of late curative surgery.

The location of the lesion has a definite influence on the course of the disease. It is a common observation that superficial lesions show the greatest tendency to heal. Such lesions are easily approached and the tissues may be kept open without difficulty. Thus, infections of the tibia and fibula have yielded most readily to simple operative procedures. The femur offers more difficulty and is harder to keep exposed. Lesions of the upper end of the femur and of the pelvic bones are notoriously difficult to deal with, and patients with such a localization of the disease usually undergo repeated operations without relief. The rule of location is, of course, not a hard and fast one.

The surgical technic used will always play an important rôle in any method of treatment for chronic osteomyelitis. We have observed that when gross sequestrums can be removed without disturbing living bone, healing will usually occur whatever method of after-treatment is used. Where this is not possible and living bone must be attacked to expose the sequestrums,

it is our custom, whenever it is necessary to detach the periosteum, to remove the underlying denuded area of bone. This bone usually represents involucrum, and practically all its blood supply comes from the periosteum. If the periosteum is removed and the bone is left, it will in many cases sequestrate. We also feel that cutting instruments are probably used too frequently. Often mere exposure of the diseased area is all that is needed. The problem of chronic infection is not nearly so important as the necessity for as little interference as possible with the blood supply of the borderline bone cells. Osteomyelitis presents not simply the problem of creating a hole in a diseased bone; it is rather a disease the treatment of which requires mature clinical judgment, and this judgment can be gained only by experience.

Recurrence is a condition imperfectly understood. In some cases it seems to be a breaking down of scar tissue from insufficient blood supply plus a slight injury. In still other cases, a lighting up of the original infection may occur.

METHODS OF TREATMENT

Since the advent of modern surgery, various methods have been advanced to increase the percentage of cases showing satisfactory end-results. E. H. Nichols advocated removal of the entire shaft of the diseased bone subperiosteally, depending on the periosteum to regenerate a new structure. The failure of such regeneration to occur in a number of cases necessitated the abandonment of the method. During and after the war, chemical antiseptics became popular, including iodoform, surgical solution of chlorinated soda and its derivatives, boric acid, and gentian violet. At that time we were using bismuth iodoform paste. The petrolatum pack had been used sporadically in this country. Orr, a few years ago, decried the use of chemicals and called attention to the fact that antiseptics injure the healing surfaces and do considerable damage to the tissues and thus hinder rather than aid in bringing about the desired result. He advocated a wide opening of the diseased area to be followed by a packing of the wound with petrolatum gauze. The operative field is then sealed by a plaster cast to insure complete rest. The wound thus remains bathed in its own fluids. The cast is removed and the wound repacked when the odour becomes too foul or if the temperature of the patient becomes elevated. This method is thought to produce an autovaccination. There have been many favourable reports of the Orr treatment and it is widely used at this time. It has been employed in the Orthopaedic Clinics at the University Hospital and at the Children's Hospital in Columbus for the past four years with some good end-results.

THE BAER TREATMENT OF OSTEOMYELITIS

The use of blow fly larvæ in the treatment of osteomyelitis was suggested to Dr. Baer by his observations of maggot-infested wounds in 1917. The patients with compound fractures who arrived at the base hospitals with wounds so infested seemed to him to be in unusually good condition. Their freedom from complications, and subsequent smooth convalescence, were in sharp contrast to the general average. As a result of these observations made during the war period, he began, about three years ago, the use of larvæ in the treatment of chronic osteomyelitis. His experience in eighty-nine cases has recently been presented in a posthumous report, together with the technical details of preparing the larvæ for use and the handling of them in relation to the wound. He was convinced that this method of treatment gave a more rapid and permanent healing in a large percentage of cases than any used previously in his clinic. The use of larvæ as directed by Dr. Baer is strictly an after-treatment, and surgery is a necessary preliminary in all cases.

In October 1930 a study of the Baer method of treatment for osteomyelitis was undertaken at Ohio State University as a co-operative project between the

Department of Zoology and Entomology and the Departments of Medical and Surgical Research and of Clinical Orthopaedic Surgery in the College of Medicine. This arrangement has made possible a complete series of studies, beginning with the rearing of the flies and ending with the treatment of patients in the hospital.

Two species of flies have been used, *Lucilia sericata* and *Phormia regina*. The methods developed for rearing the flies and other experimental work in connection with the production of sterile cultures of maggots for clinical use have been presented in some detail in another communication. It is essential that adequate precautions be taken to insure the absence of both aerobic and, more particularly, anaerobic (*B. tetani* and *B. welchii*) bacterial contaminants in all cultures of maggots destined for implantation in human cases.

As the clinical demand for larvæ naturally fluctuates considerably, according to the number of patients, it has been important to develop some method of storage. It has been found that in larvæ which have been allowed to feed normally at room temperature (28°C.), development can be halted by reducing the temperature to 8 or 10°C. They have been implanted after three to five weeks of such storage and found to have four or five days of scavenger activity before pupation.

CLINICAL RESULTS

The treatment has been used in twenty-six unselected clinical cases so far. Of these, twenty-two are healed without a sinus. Baer's technic has been observed and carefully followed. Surgical preparation of the wound prior to implantation is necessary. This consists of a wide opening of the soft tissues, a curved incision being made when possible, sometimes even a moderate amount of soft tissue being incised. Sequestrums, if present, are removed. In the deeper-seated lesions we are beginning the use of self-retaining wire retractors as a means of maintaining exposure. The wound is then packed with dry gauze. This is removed in from two to three days and the first implantation of larvæ is made. The skin edges are covered with adhesive plaster and the wound is enclosed with cages of fine wire, which is supported by a square wall of sponge rubber also fastened with adhesive plaster. Implantations are made from test tubes instead of from flasks, and a gallbladder spoon was found to be the most convenient instrument for this purpose. The wound is redressed every three to five days, according to the survival period of each larval implantation. As they reach maturity the larvæ wander out of the wound, and their appearance in any numbers outside the dressing is an indication of approaching pupation. The larvæ are washed out of the wound at the end of each treatment, a clean, dry dressing is applied, and the patient is given a rest of twenty-four hours before the next implantation.

The early cases demonstrated the importance of gaining some experience in the method. For instance, it was found that too immature larvæ failed to survive the change of environment when placed in a fresh wound. Seventy-two hour old cultures were found to be most desirable. The age of the larvæ becomes less important after several implantations in a given case. This may be due to the gradual increase in alkalinity reported by Baer, and also observed in this series, since it has been shown that larvæ thrive best in an alkaline medium. Larvæ will not live in the presence of excessive acid secretions. Irrigation of such wounds with Seiler's solution, which is mildly alkaline, was carried out just before implantation, following which the larvæ were able to maintain themselves. Quantity is an important factor, and we feel that very large numbers of larvæ are necessary in the early stages when necrotic tissue is plentiful. In the later stages of healing it must be remembered that overcrowding may cause the larvæ to leave their food before they are fully developed.

It is very important that free drainage be secured. Any accumulation of pus in a wound may lead to

drowning of the maggots. In a subacute case in the lower leg we were unable to establish the maggots until a counterincision had been made through the calf of the leg for insertion of a drain. This acted as a sewer, prevented accumulation of pus, and allowed the larvæ to sustain themselves.

The series studied consists of twenty-six cases, which twenty-two are known to be healed at this time without a sinus. Seven children and nineteen adults are included. The healed cases comprise lesions involving the femur in five cases, the tibia in twelve, the radius in two, and the ulna, humerus and a metatarsal bone in one each. Some of these cases were of long standing. One, in particular, involved the middle of the shaft of the femur in a man, aged 50. It dated back seven years and represented the recurrence of a childhood lesion. We had some difficulty in keeping the wound open as yet complete healing occurred in ten weeks and the lesion has remained healed for six months up to an including the present writing. Another patient, age 21 years, with multiple sinuses, presented a lesion involving the ilium and upper end of the femur. Convalescence was slower in this instance, requiring three months altogether. The wound has now remained healed approximately four months.

There was a recurrent lesion of the tibia in a man, aged 24. He was operated on by one of us four years ago and treated by the Orr method. His healing time then was seventeen weeks and his lesion remained inactive for three years. The recurrence at the time of the second operation was altogether similar to that seen four years previously. Maggot treatment was used after an identical surgical procedure, and healing was complete in eight weeks.

A woman, aged 38, had a lesion of the upper end of the femur, of three years' duration, with sinuses front and back. The hip was opened from in front, while counterdrainage was made posteriorly because of the presence of a large amount of pus. Healing occurred in eight weeks. The bone was not badly involved in this patient and we were content to open the soft tissues, merely exposing the surfaces of the areas of diseased bone. The joint was not involved.

The children, with one exception, all presented lesions that had been in existence for from three months to one and one-half years. One of these involved the upper end of the tibia and had been previously operated on in our clinic without success.

One of the children, a boy, aged 3 years, was admitted with an acute osteomyelitis. His temperature at the time of operation was 104.5°F. and the white count was 52,000. His lesion was in the lower end of the femur and had progressed rapidly during the five days prior to admission. Pus was found in the bone marrow on drilling through the shaft and cultures were positive for *Staphylococcus aureus*. With the maggot treatment, he was completely healed in six weeks. We cannot but feel that this child was helped by his youth and a favourable type of infection, and that because of these factors there was very little thrombosis of the blood supply to the bony cortex. Baer thought that the larvæ when used in acute osteomyelitis speeded up sequestration, but he did not observe that the separation of necrosed bone was prevented by this treatment.

All of the cases treated thus far in children have proceeded promptly to uneventful healing in an average time of nine weeks.

We are impressed by the rapid improvement in the appearance of the wounds undergoing larval treatment. When the post-operative packing is removed there appears a crater-like wound the bottom of which is made up of bare osseous tissue. This may be partially covered with detritus and pus. Usually by the end of the second implantation, small islands of granulation tissue are seen to be growing out of the exposed bony surface and also growing in from the sides of the wound like a pannus. As the treatment proceeds, this raw area becomes covered over with bright red granulation tissue. The entire wound at this time is bathed with a clear, glistening fluid, which gives a striking

shed to all the tissues. If the treatment is discontinued at this point, a few drops of surface pus will gradually form, and the dressing will show considerable moisture. By the end of the fourth week of treatment, the wound shows only a slight depression, and is only about half of the original circumference. The epithelium at this stage of healing shows rapid proliferation. The number of larvae implanted must necessarily be lessened because of the reduced size of the wound, or even discontinued altogether. A slight surface infection may remain which, according to Bier, consists of the presence of *Bacillus proteus*. It has been our practice to apply zinc oxide dressings at this time, changing them once a week. In from three to four weeks the wound is completely covered with new epithelium, and thereafter all dressings are discontinued.

There have been four patients in this series who for one reason or another do not represent an entirely satisfactory end-result; two represent frank failures; the others were under observation and treatment for insufficient periods of time. A man, aged 41, presented a lesion of twenty-two years' duration involving the upper end of the femur and the ilium with fusion of the hip joint. The surgical problem was trying. Three or four sinuses were posterior, the other anterior. The Smith-Petersen incision offered the only method of laying the area wide open. This patient received eight implantations of maggots before leaving the hospital. At that time all his posterior sinuses were healed and he presented healthy granulations anteriorly. Unfortunately, he left the city at once and we have been unable to trace him.

A man, aged 30, had an acute recurrence of an old lesion involving the entire upper end of the tibia, including the knee joint. His leg was opened widely but the pus was so plentiful that the larvae drowned at each implantation. Ultimately, posterior drainage solved this problem. The lesion then cleaned up rapidly, and the cavity was filling in with healthy granulation tissue. Unfortunately, he became homesick and summarily departed from the hospital, his leg in a cast. This patient may yet be included in the list of healed cases.

A frank failure occurred in a girl, aged 12, with a sinus of twelve years' duration in the popliteal space. The drainage was thin and scanty. Roentgen examination showed dense eburnation of the bone with a cavity the size of a pea on the posterior aspect of the femur just above the posterior capsular attachment. Using the exposure of A. K. Henry, we obtained complete access to the involved area and obliterated the cavity by the use of the chisel. Following the operation, three or four cultures of larvae died in the wound after implantation. This was the first case in the series. Whether the larvae we used were too immature, or whether alkalization of the wound might have helped we are unable to say. The surgical problem was severe, the wound was difficult to keep open, and the chance of failure under the best circumstances would always be great.

Another case of failure can, we believe, be ascribed to too extensive an operative procedure in the presence of an acute exacerbation of the disease. This was an old recurrent lesion of the humerus in a youth, aged 17. The present lesion had been draining for three years. On admission there was some abscessing of the wound with a large superficial pus sac. Because of the superficial nature of this abscess, we paid it insufficient notice. On opening it we also excavated the underlying bone cavity. Within forty-eight hours there was a copious discharge of thick, white pus. The usual implantation of maggots was made but the thick discharge continued and did not subside into the usual thin, clean exudate. The wound filled in with healthy granulation tissue but a persistent sinus remains. In this case a fundamental rule in the treatment of chronic osteomyelitis was violated. In the presence of an acute exacerbation of the disease, no operation should be performed on the bone tissues. We feel that this failure is the result of erroneous judgment at the time of the

operation and not to be attributed to the method of treatment. The patient is still under observation, and healing may yet be promoted.

We are unable to offer an unequivocal opinion on the ultimate value of this form of treatment as yet. The early results would tend to show that it is at least as effective as any method of treatment used heretofore. The healing time for all cases averaged ten weeks. The shortest period of healing was four weeks in a child, aged 8 years. In one case a lesion of the hip joint required three months before the epithelium became definitely closed. The type of scar observed in these cases is a distinct improvement over that usually seen. The granulation tissue fills up the wound from the bottom, leaving no retracted areas, and with apparently a good blood supply, which should be favourable in tending to prevent recurrence. There was not a single case of secondary abscessing, such as we have observed in other forms of treatment. In no case has a metastatic lesion developed. The main factors involved in bringing about healing by this method are probably the scavenger activity of the maggots in removing devitalized tissue favourable for bacterial growth, and the production of an increasingly alkaline reaction in the wound.

With the co-operation of Prof. William A. Starin of the Department of Bacteriology, it has been proved that there is no demonstrable bacteriophage agent present in the larvae that would account for their favourable action. The possible involvement of an additional factor or factors that contribute to the healing process offers opportunity for further studies in the promotion of healing. Such studies are now in progress.

The success or failure of any form of treatment will usually vary directly with the judgment used in meeting the problems encountered. Failure should always cause one to review his method of attack with great care. We cannot but feel in the present series of cases that the expectations might have been carried to a more successful conclusion could we have known the potential causes of failure, which are now apparent.

SUMMARY

1. Twenty-two of twenty-six children and adult patients, with either acute or chronic osteomyelitis, have been successfully treated with fly larvae during the past eighteen months in the university osteomyelitis clinics.

2. The average healing time for all cases has been ten weeks; for those lesions occurring in children, seven weeks.

3. The type of scar remaining is a distinct improvement in that there is an obliteration of the cavity occasioned by operation and the disease process through the ingrowth of healthy granulation tissue with at least partial restoration of the blood supply.

4. The best surgical judgment must always be exercised in the individual case and precede the after-treatment with fly larvae, if satisfactory results are to be obtained.

The Pentavalent Compounds of Antimony in the Treatment of Kala-azar

Part VII

Neostibosan: Di-Ethyl-Amine Para-Amino-Phenyl Stibiate; 254 Cases

By L. EVERARD NAPIER, M.R.C.S., L.R.C.P. (Lond.)
(Abstracted from the *Indian Journal of Medical Research*, Vol. XIX, January 1932, p. 719)

The results of treatment with this preparation

THIS series includes all the patients treated by Bayer 693 or 693B (Neostibosan) up to the end of the year 1928. The total number is 254.

The immediate results of treatment can be summarized as follows:—

Discharges as cured ..	244
Failed to respond to treatment ..	4 or 1.57 per cent.
Died during treatment ..	6 or 2.36 "

Of the 244 patients discharged as cured 27 have not been traced; the results of treatment, as judged by the clinical condition of the patient 6 months after discharge, of the remaining 217 is known and can be summarized as follows:—

Completely cured ..	199
Died within 6 months of discharge from some other disease ..	5 or 2.30 per cent.
Relapsed ..	13 or 5.99 "

Thus, if we deduct the failure rate, the death-during-treatment rate and the relapse rate we have left a cure rate of 90.08 per cent., or if in addition we deduct the death-from-other-causes rate we have a cure rate of 87.78 per cent.

The above figures are for all cases, including previously-treated cases; if we exclude the latter the cure rate figures for primarily-treated patients are slightly improved. The 4 'failures' had all been treated previously and had relapsed; the other figures are:—

Completely cured ..	181
Died within 6 months of some other disease ..	5 or 2.55 per cent.
Relapsed ..	10 or 5.10 "

Thus, for primarily-treated cases there are no failures and by deducting the relapse rate and the death rate one gets a cure rate of 92.54 per cent., or if in addition we deduct the death-from-other-causes rate we get a cure rate of 89.99 per cent.

Dosage in relation to cure and relapse

Conclusion.—It would thus appear that where large numbers of patients are to be treated actual total doses of 2.25 grammes or relative doses of 3.0 grammes are the most suitable; to give more would be uneconomical and to give less would mean a distinct increase in the relapse rate.

The methods of administrations

Conclusion.—The intravenous injection of a 5 per cent. solution would appear to be the method of choice, but there appears to be no reason why a 25 per cent. solution should not be given intravenously, or why, if difficulty arises in giving the injections intravenously, a 25 per cent. solution should not be given intramuscularly.

Distribution of the dosage

It has been suggested above that a total actual dose of about 2.25 grammes is the optimum; there are a number of ways in which this dose can be divided up. The patients can be divided into three main groups:—Those given 8 injections, on alternate days; those given 8 injections, on 8 consecutive days; and those given 5 injections, on 5 consecutive days. The total dosage in each case was about the same.

To summarize, it appears that by giving the concentrated course of 5 injections the period of fever is shorter and the leucocyte increase is greater than with the other two courses, that the increase in weight is about the same as the average of the other two courses, and that, though the reduction in the size of the spleen is less marked, this is probably on account of the shortening of the length of the time under treatment and therefore of the time the patient remains under observation. There is a possible fallacy in the fact that only a small number of patients, eleven, are included in this group.

Conclusions.—One must admit that the evidence of the question of distribution of dosage is not entirely

conclusive, but that there would appear to be no disadvantage in giving injections daily.

Criteria of cure

The evidence of cure in this series is the same as that of all the previous series, either a clear, written statement by the patient himself, or his relative or medical adviser, or a personal examination of the patient, at least six months after discharge from hospital. In only one instance in his experience has the writer seen a relapse occur in a patient who has been reported cured after this interval; this did not occur in this series.

The various clinical factors which might be of value in judging whether a patient is cured or not at the time of his discharge are discussed.

Conclusions.—To summarize one must conclude that there are no immediate criteria of cure, and that the prognosis in any case can be made better by knowing the amount of antimony preparation that has been given than by the employment of any laboratory tests, or by consideration of the clinical progress under treatment.

After an efficient course of treatment the interval in most cases before a 'negative' spleen or liver puncture culture can be obtained is so long that this is not a practical method of prognosis; the interval of 14 days which we have allowed in this series is obviously too short.

No hard and fast rule can be laid down for the leucocyte count, but amongst the cases in which this was done one week after the conclusion of treatment no case with a count of over 6,000 per c.mm. relapsed, though only 25 per cent. of the cases with a count below this figure relapsed.

From the duration of the febrile period a little information can be obtained; in almost every case in which a relapse occurred the fever lasted for a longer period than eight days, but in only about 15 per cent. of the cases in which it continued for longer than 8 days did a relapse occur.

From the size of the spleen and the weight of the patient at the time of discharge practically no information of any prognostic value was obtained.

Other factors influencing prognosis

Effect of duration of the disease on prognosis.—It is repeatedly stated, even by writers with considerable experience in kala-azar but more frequently by those with little or no practical experience, that if the disease can be treated in its earliest stages a cure can be effected more easily than at a later date. The present writer has for a long time maintained that there is no justification for this assumption which, if based on clinical experience at all, is probably based on experience of the treatment in provisionally-diagnosed cases. In this series, of the patients who had not been treated previously 10 relapsed; of these 9 gave a history of fever for 6 months or less, and 1 gave a history of 1 year's fever. Of one hundred unselected cured cases in the same series 45 gave a history of fever for 6 months or less, whereas 55 gave a history of fever for a longer period than this. This suggests very strongly that early cases do not respond best to treatment, but that the reverse is actually the case. This remark can, however, only apply to previously untreated patients.

The aldehyde reaction before treatment and prognosis.—Although 69 per cent. of the cured cases originally gave a +++ or ++ reaction, only 3 out of 10 of the relapsing cases gave these reactions. It has been suggested that the aldehyde reaction is evidence of an immunity response. It may, however, simply be additional evidence that early cases do not respond so well to treatment as fully developed ones. The suggestions are not mutually exclusive.

Conclusions.—There is no evidence that kala-azar is more amenable to treatment in its early than in its later stages. There is on the other hand some evidence that the reverse is the case.

It seems possible that the degree of reaction occurring in the 'aldehyde test' is an indication of the degree of immunity response occurring in the patient.

Reviews

ASTHMA AND HAY FEVER IN THEORY AND PRACTICE. Parts I, II and III.—By A. F. Coca, M.D., M. Walzer, M.D., and A. A. Thommen, M.D. London: Baillière, Tindall and Cox, 1931. Pp. xxii plus 551, with 97 figures in the text. Price, 45s.

This volume of nearly 800 pages, mostly in small print, gives a very complete and exhaustive account of asthma in theory and practice. It is divided into three parts; the first part deals with the phenomenon of hypersensitiveness, anaphylaxis or allergy, and is written by Dr. A. F. Coca. The phenomenon of hypersensitiveness is subdivided into five main classes:—(1) the true anaphylaxis which is seen in lower animals and can be induced experimentally; (2) atopy peculiar to man and an inherited condition; (3) hypersensitiveness to infection, which is observed in all animals susceptible to tuberculosis as a result of previous infection; (4) contact dermatitis or dermatitis venenata which occurs any time of life and develops after being in contact with the excitant; (5) serum diseases which develop when large doses of foreign proteins are inoculated into an individual.

The second part of the book is by Dr. M. Walzer and deals with the whole subject of asthma in very great detail. Almost every phase of the syndrome is carefully and thoroughly discussed. The third part on hay fever by Dr. A. A. Thommen occupies 300 pages, and is the best account of this phenomenon written in the English language. A good deal of the subject-matter is devoted to pollination, which is very necessary in order to understand how pollens come to play a part in producing hay fever. One sees the reason why the wind-borne pollens are the main cause of hay asthma. He states five postulates that are necessary for the pollen to produce fever, i.e., (1) the pollen must contain the excitant of hay fever, (2) it must be wind-borne, (3) the pollen must be produced in large quantities, (4) it must be sufficiently buoyant to be carried by the wind over considerable distances, so that the species, weight of the pollen, and physical character of the pollen grasses are important, (5) the plant producing the pollen must be widely and abundantly distributed. From these postulates the hay-fever-producing pollens may be classified into three main groups—the pollens from trees, the pollens from grasses, and pollens from weeds. The aetiology and mechanism of the production of hay fever is then carefully discussed, and in the chapter on the nature of hay-fever-causing substance in the pollen it is considered to be a polysaccharide of a glucosidic nature. Finally, the non-specific and specific treatment of hay fever is discussed in detail.

This volume should be in every medical library and in the hands of practitioners who are dealing with these phenomena, as it gives a complete and exhaustive account of our present knowledge on this subject. The bibliography at the end of each chapter is very extensive and the few references tested were found accurate as regards pages and dates. The work is used in our laboratory daily to look up the various points that arise during the course of our research on asthma. The phenomena of urticaria and dermatitis venenata, and the rarer conditions of intestinal atopy are not discussed at length. We would recommend that in the future edition, in order to make this very good work complete, these should be considered more fully.

H. W. A.

THE HEART AND SPLEEN IN HEALTH AND DISEASE.—By G. Arbour Stephens, M.D. London: H. K. Lewis and Co., Ltd., 1932. Pp. xi plus 139, with 6 illustrations. Price, 7s. 6d.

DR. ARBOUR STEPHENS has written a small book, the style of which is dogmatic and the contents very controversial.

It is evident that the author does not agree with the accepted explanations of many of the phenomena of physiology and pathology.

Indeed it appears throughout the book that he is looking for new explanations and is delighted to find any fact or experiment that will tend to upset the old order of things.

The first chapters deal with the heart sounds and with blood pressure. The causation of the former and the meaning of the latter are discussed and several theories which are new to the reviewer are put forward. They are very interesting and cause one to think, but they would not be accepted by the majority on the evidence adduced.

The chapter on auricular fibrillation is most controversial, and the attempt to explain the condition by means of mathematical formulae is not convincing.

New theories on acute rheumatism and chorea, on the spleen and calcium metabolism, on gastritis and heart disease, and on the causation of cancer are discussed.

Older explanations are cast to the winds, and many dogmatic statements are made on what appears to be insufficient evidence. But it is all very interesting and will be read with pleasure by the many who are dissatisfied with the teachings they now receive and the theories that they now have to accept.

On the other hand it will be read with annoyance by those who are conservative in their opinions and do not like to have their cherished beliefs shaken even in a minor degree.

H. H.

RESEARCH WORK ON THE PNEUMOCOCCI AND THEIR ENZYMES AND ITS SIGNIFICANCE IN LOBAR PNEUMONIA.—By A. C. Guthrie, M.B. (Edin.). London: Baillière, Tindall and Cox, 1932. Pp. ix plus 60, with 8 plates. Price, 7s. 6d.

This small book of 60 pages gives the author's experimental results on the pneumococci and their serological relationship. The first half of the experiments were conducted with untyped pneumococcus strains. The second half of the experiments were done with types 1 and 3, and as the result of these few experiments the author comes to the following conclusions.

(1) That hæmatotoxin is neutralized in the presence of oxygen, therefore it is imperative that during the whole course of the disease the patient should be given oxygen.

(2) That the effectivity of the serum depends upon the quality and quantity of the complements in the patient's blood, this should be estimated and if deficient should be supplied by injecting fresh blood under the usual precautions.

(3) That, as bile extract causes complete solution of the pneumococcus, it should always be given in this disease in the form of oleate of sodium.

(4) The importance of optochin and antibody solution in conjunction.

(5) A hope is expressed that at some future date an enzyme derived from a soil bacterium may be useful in the treatment. Finally, the use of anti-pneumococcal polyvalent serum for the treatment of pneumonia is discussed.

H. W. A.

THE BIOCHEMISTRY OF MUSCLE.—By D. M. Needham, M.A., Ph.D. London: Methuen and Co., Ltd., 1932. Pp. viii plus 439, with numerous diagrams. Price, 5s.

THE subject of biochemistry has made such rapid strides during the last 30 years that it is very difficult for members of the medical profession to keep themselves abreast of the present state of knowledge in its various branches. In the domain of the physiology and biochemistry of muscle, the researches of Hill, Ritchie, Zimmermann, Fletcher and Hopkins have caused a revolution in our views regarding the fundamental processes of conversion of chemical energy into the energy of contraction. The ideas regarding the

metabolism of lactic acid, the source of energy production during contraction, the part played by phosphates and the mechanism of carbohydrate breakdown, the production of adenylic acid, pyrophosphoric acid and phosphagen, as precursors of ammonia, have also undergone considerable modifications. The physiology of muscular exercise and the fuel supply to the muscle have now, in the light of the investigations carried on, been more clearly explained. The monograph of Dr. Needham has presented all the different phases of development of the subject in a condensed form. The subject is complicated and the crystallization of the matter to suit the size of the monograph series has made the book a little difficult for the ordinary readers. The advanced research workers on the subject will, however, have the whole development of the subject very handy for quick survey and ready reference.

R. N. C.

PHANTASTICA-NARCOTIC AND STIMULATING DRUGS: THEIR USE AND ABUSE.—By L. Lewin. London: Kegan Paul, Trench, Trubner and Co., Ltd., 1931. Pp. xi plus 335. Price, 15s.

THE history of drug addiction is as old as human civilization. From the earliest times man, all the world over, has been in search of substances that allay fatigue produced by overwork, relieve pain and produce sleep when there is insomnia. Such drugs inspire with hope the mentally tortured, supply new vitality and vigour to the afflicted, and produce pleasurable sensations and euphoric effects. The effects produced by these drugs, in the beginning at any rate, are so attractive that their use is frequently repeated giving rise to habit formation. There are plenty of drugs of vegetable origin, as well as synthetic chemicals, belonging to this category, which are being used in one country or another both for honest purposes or with dishonest intention. New drugs are also being produced. The literature, however, on the subject of drug addiction is scanty and scattered, and reliable information about various drugs of addiction is very difficult to obtain.

Phantastica is the first book of its kind, which deals with almost all important drugs of addiction throughout the world, and being written by an experienced pharmacologist, it supplies a long-felt need. The drugs are classified and dealt with under five groups according to their action on the human body. After giving a short description of the general pharmacological action of drugs the author gives a detailed account of the history, extent of addiction, mode of consumption of each, as well as the toxic effects produced on the human body. The whole subject is treated in a very comprehensive and lucid manner, and will be of great help to those interested in drug addiction problems. The opinions expressed in the book are all the result of the author's practical experience and laboratory experiments over an extended period, and will serve as a safe guide. The first edition of the book in German was widely read and appreciated. The second edition contains more material and the excellent English translation by P. H. A. Wirth, P.H.C.B.Sc. (Munich), will be greatly appreciated by English-speaking people.

R. N. C.

VEGETABLE MATERIA MEDICA OF INDIA AND CEYLON.—By E. Roberts, M.R.C.S. (Eng.), F.R.F.P. & S. (Glas.). Colombo: Plate Limited, 1931. Pp. iii plus 437.

Vegetable Materia Medica by Dr. E. Roberts presents in a brief space the properties and uses of a number of vegetable drugs found in India and Ceylon. Though it is largely a compilation from some of the well-known treatises on Indian indigenous drugs published during the latter part of the last century, original observations from the personal experiences of the author have also been freely incorporated. Many useful formulae and recipes are given which are likely to be of very great help to the physicians. Of late years a great deal of interest has been taken in the study of the indigenous drugs and it is being increasingly felt by a

section of the profession that enquiry and research into the vast domain of the *materia medica* of India and Ceylon is likely to bring to the medical profession more useful remedies to combat disease. The information regarding many drugs is not easily available as most of the literature on the subject is out of print and not available to the ordinary medical reader. A book of this kind will, therefore, interest the profession in this country.

R. N. C.

SANITARY LAW—IN QUESTION AND ANSWER.—By C. Porter, M.D., B.Sc., M.R.C.P. (Edin.), and J. Fenton, M.D., D.P.H. Third Edition. London: H. K. Lewis and Co., Ltd., 1932. Pp. xvi plus 220. Price, 7s. 6d.

SANITARY LAW, in other words, the reflection and attitude of public opinion towards health matters in the laws of the state, has undergone many changes within the last ten or fifteen years. Sanitary administration and local self-government in England have been very definitely changed by the Local Self-Government Act of 1929. Tuberculosis, venereal disease, food, housing, maternity and child welfare work, mental deficiency and nursing have all received very special attention. There has therefore been a tendency for sanitary law to become diffuse and scattered in many acts. This is a sign of progress, but leads ultimately to some confusion and difficulty in administration of the law. At intervals it becomes necessary to collect and consolidate scattered acts into a uniform and comprehensive whole. English sanitary law needs such treatment now, and if it were done would be a great benefit to all concerned, particularly to the student preparing for his diploma in public health. At present however public health law is a difficult subject. Its treatment in such a book as the one under consideration makes it considerably easier, however. The question-and-answer style helps precision and memorization; the questions are sensible and searching, and the answers clear and unequivocal. The chapters are logically arranged; environmental law takes up a large portion; we would have preferred to see the Local Government Act of 1929 dealt with right at the beginning instead of at the end of the book. There are some omissions which we think important. Post-vaccinal encephalitis is not mentioned in the index or in the text, though it is the subject of an important vaccination order; carriers too are not dealt with in the index or in the text, and here again there is at least a regulation dealing with their detection and treatment. 'Standard Milk' is not defined in the Condensed Milk Regulations, though it is the pivot of the regulations; under the Alkali Acts it would have been as well to give the standards of effluent gases. The book is readable and should prove of distinct assistance to students reading for their diploma of public health.

A. D. S.

A GUIDE TO ANATOMY.—By E. D. Ewart. Third Edition. London: H. K. Lewis and Co., Ltd., 1932. Pp. xii plus 338, with 98 illustrations. Price, 12s. 6d.

THE publication of the third edition of this book is very welcome. The subject-matter has been dealt with in five sections, viz, osteology, the trunk, the head and neck, the upper limb and the lower limb. In dealing with the muscles the author has gone into details, so far as the important muscles are concerned, avoiding unnecessary details for the less important ones. The muscles concerned in the various movements of the joints have been nicely tabulated. The cutaneous distribution of the nerves has been well illustrated. There are 98 illustrations, of which four are coloured. Though most of the illustrations are uncoloured they are very attractive and useful. The surface marking of the important structures has been appropriately incorporated. The old nomenclature has been retained throughout. The book is strongly recommended for the students preparing for the examination of the

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Chartered Society of Massage and Medical Gymnastics and other allied examinations for which it is meant. The inclusion of specimen question papers will be much appreciated by such students. The get-up of the book is excellent.

N. P.

LIGHTNING, LIGHTNING-STROKE, AND ITS TREATMENT.—By H. A. Spencer, M.R.C.S., L.R.C.P. London: Baillière, Tindall and Cox, 1932. Pp. ix plus 91. Price, 5s.

THE author of this small book has had many years' experience in that home of the thunderstorm the Transvaal.

He has had opportunities of studying the effects of lightning in many cases and has described with dramatic skill the suddenness of this catastrophe and the resulting injury to the human frame.

The person through whom the current directly passes is invariably killed; those in the vicinity suffer from the violence of the displaced air and others near by may be so electrified that violent muscular cramps are the chief symptoms.

Treatment, which chiefly consists of prolonged artificial respiration, is adequately described.

Although this book must be of great interest to all, it can only be of practical value to those whose work lies in some of the more remote parts of the earth.

H. H.

BIRTH CONTROL AND PUBLIC HEALTH. London: Published by the Society for the Provision of Birth Control Clinics, 153A, East Street, Walworth Road, London, S.E. 17. 1932. Pp. 33. Price, 1s.

RECENT editorials in this journal on the population question in India have led to the receipt of numerous letters, and many of our correspondents accuse us of being whole-hearted advocates of contraceptive methods. This is not quite true. Primarily the growth of a population is limited by economic factors which govern the situation quite independently of any birth control measures. Thus Raymond Pearl has shown that for any country there is a characteristic growth of population curve. At first, with abundant food supplies and unlimited room for expansion there is a rapid growth of population; then a nodal point is reached at which the yearly increase in population becomes progressively less and less; until finally a condition of stability is reached where the population remains about stationary. In Europe such countries as France and Great Britain have reached the stationary level; in the United States on the other hand the nodal point has hardly been reached.

A good example of limitation in population without the use of contraceptive measures is afforded by the Irish Free State. Here the natural growth of population has been held up for several years, not by the general use of contraceptive measures—to which the clergy of the Catholic Church are vigorously opposed, but by economic stress leading to fewer and later marriages. In India similar economic stress is likely to lead to similar results, whilst there must be very few of our readers who do not realise the grave and urgent need for later marriages and for pre-natal care.

On the other hand, it must be realised that the birth control movement has come to stay, and, in our opinion, rightly so. The teaching of contraceptive methods is not the only function of birth control clinics; frequently they enable women who desire to have children to 'space' the births to fit in with the family resources, and with the best results in health of mother and children; still more often gynaecological deformities or diseases are detected which prevent pregnancy, and the patients referred to the proper hospitals for treatment. It must be admitted, however, that in all civilized countries there is a rapidly increasing use of contraceptive methods. Under these circumstances there can only be one logical attitude for the medical profession to take up, that such contraceptive methods shall be

scientifically investigated, that only such as are efficient and harmless shall be selected, and that the medical student of the future shall be taught birth control methods in the interests of the numerous patients who will consult him on the matter when he goes into practice. Twenty-five years ago contraceptives—many of them useless or even harmful—could only be obtained in London in horrible little grubby shops in obscure streets, which also specialised in the sale of pornographic literature; to-day probably quite the majority of medical men approve of the birth control movement, and the birth control clinics are conducted on sane and rational lines, and relieve an enormous amount of suffering among the poorer classes, suffering both of mothers and children.

In this small brochure published by the Society for the Provision of Birth Control Clinics the history of the last ten years' work of the Society is reviewed, and the book is one which should be read and studied by every medical practitioner. In the preface Professor Julian Huxley points out that Britain has always played a leading part in the movement; largely thanks to the Society for the Provision of Birth Control Clinics. 'In the following pages may be read the account of the first ten years of their existence—their struggles, hard work, discouragements, successes, the slow but steady spread of their influence'. No fewer than sixteen clinics have been founded in seven years. 'The first and most obvious importance of birth control is its power to relieve suffering and misery', writes Professor Huxley. Secondly, it is a movement for social justice; 'our children will look back with incredulity upon an age in which doctors could warn women that they must on no account become pregnant again, and yet withhold all advice as to how this could be accomplished, even when implored to give it'. The movement is one directed towards the prevention of destitution and degradation. 'The long and the short of it is that population must be regulated; that birth control is the main method for this regulation; but that unless birth control itself be consciously studied and regulated, it may well run away with the situation..... Birth control must be envisaged as a major sociological factor, and must be studied in relation to the world's population trends and economic changes..... Finally there comes the relation between birth control and eugenics'.

Turning to the main body of the report, the first section deals with the history of the Walworth Women's Welfare Centre, which was first opened in 1921. Here there is stressed the fact that women resort very largely to abortifacient drugs, and not infrequently with fatal results. 'It cannot be too often repeated that the effective alternative in Great Britain at the present time is not between birth control on the one hand and uncontrolled reproduction on the other, but between birth control on the one hand and abortion on the other. This second alternative has been pushed to its logical conclusion in Russia, where abortion by doctors is legalised, and thousands of these operations are performed every year. Most English people would prefer the first alternative—namely birth control—leaving abortion and sterilization to be used only in those cases of mental and physical disease for which contraceptives are unsuitable'.

The Walworth centre has dealt with 14,527 patients since its first opening, and here case index cards have been introduced and much information is being collected. 'Following up' is difficult, as patients dislike receiving letters and visiting them is practically impossible; in the smaller centres it is easier to obtain information as to after-results. At Walworth only women medical officers are employed and only married women are fitted with pessaries. Many of the patients are sent by local doctors, and appliances are provided at prices far below those in the retail trade, or for the poorest class of patient, free.

Chapter 3 deals with the sixteen affiliated clinics throughout Great Britain and here the factor of poverty due to unemployment becomes very prominent.

Statistics collected by the Birmingham clinic give the average number of pregnancies per patient as 7.97 for the last generation, and 3.8 for the present generation. This is followed by the report of the medical officers to the Society for the years 1924-1931. This report is in itself so much of the nature of a review that it is impossible to review it. The ideal contraceptive has yet to be found, but at least the methods in use by the Society are reasonably successful and cause neither physical injury nor sterility. Of 97 patients who ceased to practice birth control because they wished for a child, 96 became pregnant and had babies; 158 patients, who on one occasion neglected to use the method advised, became pregnant; these figures refute the criticism that the practice of birth control causes sterility. The method usually advocated is the use of a Dutch pessary to occlude the vagina, together with a soluble suppository. The former is made in 19 different sizes, and each patient has to be individually fitted.

Chapter 5 deals with research, and here two main lines of enquiry are outlined, the experimental investigation of new methods and testing of spermicides, and the collection of statistics with regard to the methods now in use. Chapter 6 deals with the public health aspects and political history of the birth control movement; as is well known the Lambeth Conference of Bishops in 1920 condemned birth control without reserve, whereas the same body in 1930 recognised the moral justification of the practice in certain circumstances. A notable event was the recognition of the necessity for the provision of birth control clinics by the Ministry of Health in July 1930. A final statistical table shows that whereas in 1922 the number of women to whom advice was given was 279, in 1931 the number had risen to 5,742.

This report should be read by every medical man who realises the importance of the subject.

THE HYGIENE OF MARRIAGE.—By Isabel E. Hutton, M.D. Third Edition. London: William Heinemann (Medical Books), Ltd., 1932. Pp. xii plus 140. Price, 5s.

THERE is very little new to be said on the subject of sex life of married couples, and the author has not tried to make anything new out of it—she has told what there is to tell in a simple and straightforward manner. There are very many books of this kind on the market to-day, but this is one which any doctor could recommend to his patients with confidence. It is suitable for those about to be married, for the newly married, and for those who have been married a number of years. The first edition of this book was an extremely satisfactory one, but since then the writer has added to her experience considerably, and has been able to revise and add to the book accordingly. There are chapters on birth control and contraceptives, but the subject is dealt with from the purely personal and not the national point of view, as one would wish for in a book of this nature. There is no evidence of either prudery or eroticism; honest seekers of information on the subject of sex will find the book very helpful indeed.

VILLAGE SANITATION AND A MANUAL OF HYGIENE. (Written in Bengali).—By The Late Rai Chunilal Bose Bahadur, C.I.E., I.S.O., M.B., F.C.S. Third Edition. Edited by A. P. Basu, M.A., and J. P. Bose, M.B., F.C.S. Published by A. P. Basu, Esq., 25, Mohendra Bose Lane, Shambazar, Calcutta. 1931. Pp. 310. Illustrated. Price, Re. 1-8.

THIS book is full of valuable information regarding the principles of health hygiene. It is written in a most elegant Bengali style. The chapter on food consists of a graphic description of the physiology of assimilation of the various local food problems. The book is strongly recommended to all interested in health problems and to students going up for the school final examination.

S. P. B.

BAILLIERE'S SYNTHETIC ANATOMY. Complete in Parts I—XII, with binding case. Size, 7½" × 9". Plates 156. Price, 42s. plus postage.

WITH the publication of Part X, on the brain, this very fine and original work becomes complete. We have commented in previous issues on the different parts as they were published. Each part consists of twelve transparency drawings in colour, with a lateral and vertical centimetre scale. By fitting in the different transparencies one on top of another, the student is thus able to reconstruct the entire part from the bones upwards, or, alternately to find surface markings, muscular and nerve relationships, etc. The work is not intended to take the place of dissection, the natural method, and of necessity the surgical one, by which deeper structures are approached from the surface; but by enabling the student to reconstruct the part to gain a complete mental picture of the entire part and of the relationship of the different structures to one another. This composite, stereoscopic mental picture of each region of the body can be learnt step by step and part by part by repeated drawing. Further, such outline drawings to scale can easily be enlarged to life size.

The drawings are beautifully executed and very accurate, being based on bony radiograms of each part as a basis, and submitted to a school of anatomy in order to be checked by the corresponding dissections. The different parts are each issued at 3s., plus postage; they deal in turn with the upper arm and shoulder, forearm, hand, head and neck, pterygo-maxillary region—enlarged from the section on the head, thigh and hip, leg, foot, thorax, abdomen, brain, male perineum, and female perineum. Both the old and the modern nomenclature are given, a fact which will appeal to professors of anatomy brought up on the old nomenclature. Essentially, the work is one both for teaching and learning.

Every medical library in India should be in possession of a copy of this work, and every professor of anatomy will find it invaluable. It will make an appeal to the student reading for examinations in anatomy and surgery, to those reading for a post-graduate surgical degree, and finally to the operative surgeon who wishes to look up the regional anatomy of parts which may be the site of surgical procedures. Dental students will also find it useful. It is a most original and valuable addition to the methods of learning and teaching anatomy. The popularity which the work has attained is indicated by the fact that it has already been translated into French, German, Italian and Spanish.

It only remains to add that the execution of the work is of the very high standard associated with all Messrs. Baillière, Tindall & Cox's publications, and to congratulate the medical student of to-day who will find in this work a ready and intelligible method of grasping facts, which to his predecessors of a previous generation too often constituted a veritable *via dolorosa* in the study of anatomy.

Annual Reports

REPORT OF THE DIRECTOR OF PUBLIC HEALTH, MADRAS, FOR THE YEAR 1930. MADRAS: PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS, 1931. PRICE, RE. 1-10.

THE province of Madras claims with some justification to be the pioneer of provincial public health work in India. It is therefore interesting to see from time to time how far it is keeping its place in this respect. The present report gives an interesting review of sanitary matters in the province. We are all interested in population returns at the present time. Madras Presidency in 1921 numbered 42.79 millions. The population of 1931 estimated on previous inter-censal growth was 43.71 millions; but the actual census of 1931 is 47.16 millions.

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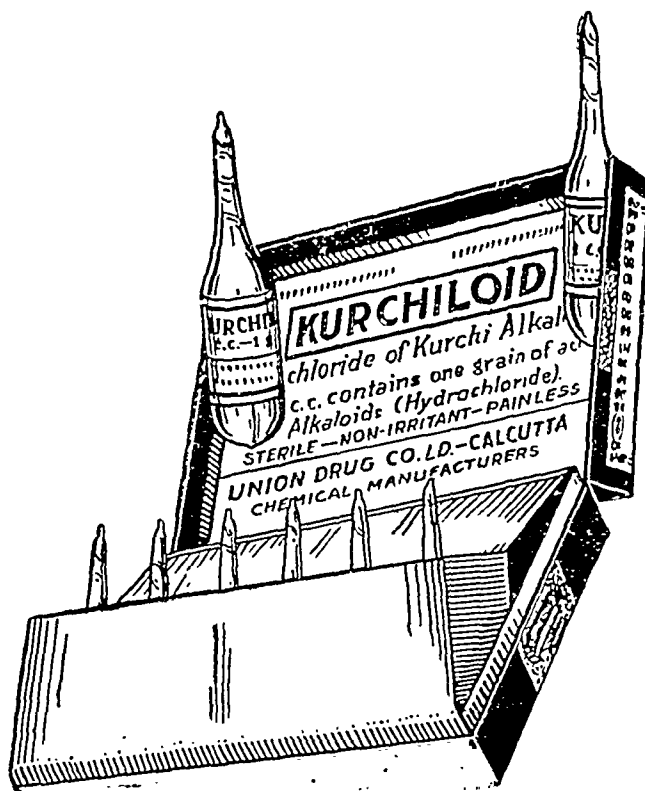
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BIRCH'S MANAGEMENT AND MEDICAL TREATMENT OF CHILDREN IN INDIA.

By V. B. GREEN-ARMYTAGE, M.D., F.R.C.P., Lt.-Col., I.M.S.,

Chevalier of the Legion of Honour; Order of the White Eagle of Serbia; Professor of Obstetrics and Gynaecology, Medical College, Calcutta, and Surgeon to the Eden Hospital; Examiner to, and fellow of, the University of Calcutta;

AND

E. H. VERE HODGE, B.A., M.D., M.R.C.P., Lt.-Col., I.M.S.,

Civil Department, Bengal.

In the new 7th Edition Colonel Green-Armytage and Colonel Vere Hodge have not attempted a revision; they have completely re-written the entire volume, which is now expanded to a compass of 482 pages, with several illustrations. The senior author has for many years been specially associated with obstetric work and the diseases of children in India, whilst the specialist knowledge of their brother workers in Calcutta on different lines of work has been culled from (and freely acknowledged) by both authors. The result is a work which is authoritative, most eminently practical, and one which will be invaluable not only to European mothers in India, but to educated Indian mothers as well; for it covers a very wide field.—*The Indian Medical Gazette*, July 1929.

THACKER, SPINK & CO., LTD., P. O. Box 54, CALCUTTA
(In Liquidation.)

The influenza epidemic in the 1911-21 decade, and the absence of such a devastation in 1921-31 is the main cause of the discrepancy. The figure estimated on the vital statistics of 1921-31 was 46.73 millions, a figure much nearer the actual. This comparatively close approximation points to a definite improvement in the registration of vital statistics in the province. The Director of Public Health states there is still much room for improvement in this respect yet however. Rural towns are particularly defective. The birth rate, death rate, and infantile mortality rate for 1930 were 39.83, 25.52, and 185.7 respectively. The birth rate is the highest on record.

A research unit in the department of public health was formed during the year for investigation of beriberi, leprosy, filariasis and guinea-worm, etc. The report of this unit should be very interesting. Beriberi is at present being studied.

Some notes on the special diseases may be of interest.

Cholera.—This shows two peaks—one in August, and one in January, corresponding to the two monsoon periods. The cholera mortality was 18,746; the lowest figure since 1923. Bellary, Kurnool, Anantapur suffered most. Bili vaccine was administered experimentally as a prophylactic; 25,000 doses were given before the outbreak of cholera, and 12,000 doses during the epidemic. The Director concludes that mass inoculation of this kind in endemic areas is useful in averting epidemics of cholera. The fatality rate amongst the unvaccinated was nearly thrice that in the vaccinated. A review of the figures of an impartial statistician would add much to the value of the experiment. The protection is put at about 4½ months.

Dysentery and diarrhoea.—76,815 deaths from these were reported. Here again the mortality is highest during the monsoon periods. Pollution of water supplies caused by the rains is said to be the chief cause of these diseases. The seasonal distribution in Bengal of cholera and bowel diseases is rather the opposite to that of Madras—the causes of the difference are not obvious.

Smallpox is still too prevalent a disease though it caused fewer deaths than in previous years. Three districts alone contributed practically the whole of the cases.

Plague is now at a period of comparatively low incidence. The department claims that the present steady reduction since 1923 has been due to its vigilance and promptness in dealing with the disease. A résumé of Colonel King's very interesting results are contained in the section. These have already been published, and tend to support the contention that while *X. astia* can be responsible for plague, the epidemics produced are very few and small and that the comparative freedom from plague of Madras Presidency as a whole is due to the fact that the indigenous flea is *X. astia*, and that severe plague is due to the importation of *X. cheopis* and occurs in places where climatic conditions are suitable for maintaining *cheopis*.

Fevers.—These form the large bulk of the causes of death. The death rate from fevers remains somewhere round about 8 per 1,000. The term includes influenza, malaria, pneumonia, etc. No differentiation of 'fevers' is apparently attempted. Malaria has been the subject of a special investigation. Relapsing fever seems to have disappeared again after its sudden epidemic appearance in 1923.

Mention is made of a peculiar disease called *ubbumariyayee* which has symptoms comparable to those of spure. It is being investigated. A survey of leprosy is going forward.

Maternity and child welfare work has not progressed much during the year but satisfactory work is reported. The school for health visitors had to be closed down for financial reasons. We understand however that it has since been reopened.

Propaganda has been maintained and the Bellary Municipality has awarded the Irwin Prize for the Best Health Week Celebrations in India.

In rural sanitation, the bore-hole latrine seems to be becoming popular, as 1,161 latrine seats were constructed during the year.

In the important matter of port health administration as the result of a conference with Mr. Clayton, I.C.S., it was agreed that every major port should have a Port Sanitary Authority and that all Port Health Officers should be under the direct control of the Government of India as port quarantine is a central subject. It would be interesting to know if the Government of India have agreed to this as a definite policy in all parts of India. A special section deals with vaccination and smallpox. The old inefficient classes of probationer vaccinators will, it is hoped, be abolished in a few years.

The report is an interesting account of health work in Madras and Major Hesterlow and his staff are to be congratulated on a successful and energetic year's work.

ANNUAL REPORT OF THE UNION MISSION TUBERCULOSIS SANATORIUM, AROGYA-VARAM, MADANAPALLE, S. INDIA. 1930-31. MADRAS: PRINTED AT THE DIOCESAN PRESS, 1932.

THE Madanapalle Sanatorium may well be termed the pioneer tuberculosis settlement in India, and its annual reports by Dr. Frimodt-Møller are always of very great interest.

When the Sanatorium first opened in 1915 the number of beds available was 109; it is now 200 and there are more than a hundred buildings scattered over an area of 100 acres. During the year 347 patients were admitted and 344 discharged; the daily average of patients treated being 190. An interesting table shows that classes and communities from which the patients come; students easily head the list, followed by clerks, cultivators, merchants, teachers, etc. The patients come from all over India, and only 55 per cent. of them from the Madras Presidency; of 344 patients discharged during the year only 52 came from the co-operating missionary societies which support the Sanatorium.

Excluding patients who left in less than a month from admission, others who were not tuberculous, etc., there remain 268 discharged cases during the year for study. For these the figures are as follows:—

	Percentage of total	Arrested	Percentage much improved	Improved
Stage 1 ..	15.3	78.1	14.6	7.3
Stage 2 ..	14.9	25.0	50.0	17.5
Stage 3 ..	69.8	..	43.9	19.3

For the sixteen years since the opening of the Sanatorium 3,043 patients have been discharged, and the corresponding figures for these are as follows:—

	Percentage of total	Arrested	Percentage much improved	Improved
Stage 1 ..	22.3	76.0	15.5	6.2
Stage 2 ..	29.3	31.8	37.8	13.3
Stage 3 ..	48.4	1.0	28.6	16.2

There are important lessons to be learnt from these figures. Formerly it was considered that only early cases should be selected for sanatorium treatment, but the Madanapalle figures show that very much can be done for advanced cases and even very advanced cases can be much improved. And at least half, if not more than half the patients admitted are in stage 3.

For the patients discharged during the year, the following further figures may be given:—

Loss of tubercle bacilli. Stage 1 patients 100 per cent., stage 2 patients 63.6 per cent., stage 3 patients 40.6 per cent.

Cessation of fever. Stage 1 patients 91 per cent., stage 2 patients 82.6 per cent., stage 3 patients 57.4 per cent.; average time to cessation of fever 95 days.

The average gain in weight during treatment of 245 discharged patients was 12.8 lbs. Artificial pneumothorax was tried in 123 cases, but in 24 of these it was not possible to collapse the lung owing to adhesions; of the remaining 99 cases 74 were discharged with positive results. Sanoorysin was given in 43 cases, tuberculin B.E. in 8 cases, and autogenous vaccines in 6 cases. There were 41 operations for phrenico-exauresis and 9 for oleothorax; it is clear that the modern treatment of pulmonary tuberculosis has its surgical as well as its medical side. With regard to complications helminthic infections easily head the list, followed by malaria and tuberculosis of organs other than the lungs. The laboratory work during the year was very heavy.

A special section of this year's report is devoted to an investigation of the after-histories of patients discharged during 1916—1925. The figures analysed relate to 964 patients traced who had left the Sanatorium more than five years previously, and include a large number of advanced cases. Of these 51 per cent. were alive and no less than 46.5 per cent. were doing full work. These results could hardly be bettered even in Europe. The subject was fully dealt with in our issue for September 1931 by Dr. Frimodt-Møller, so here we need only quote his conclusions, which are as follows:—

The whole investigation is summed up as follows:—

(1) The investigation of the after-histories comprises 1,544 patients discharged during 1916—25 and who have all been discharged from the Sanatorium for a period of 5 years or more.

(2) About one-fourth only of the patients were early cases, while more than one-third were in the most advanced stage of the disease.

(3) Of 1,544 patients, 580 could not be traced 5 years after discharge, but an examination of the records of these patients in relation to the stages of the disease on admission and the immediate results on discharge, compared with those of the patients traced, shows very little difference between the two groups. Judging from this the after-histories of the two groups may be expected to be very similar, and therefore percentages, omitting the untraced, are in this investigation approximately correct.

(4) Of the 964 patients traced, including the most advanced cases, 51.0 per cent. were living 5 years after discharge, and 46.5 per cent. were doing full work.

(5) Examined with regard to the stages of the disease on admission of the patients to the Sanatorium the after-histories show that in I stage out of 257 patients traced 214 or 83.3 per cent. were living 5 years after discharge, in II stage out of 324 patients 207 or 63.9 per cent., and in III stage out of 383 patients 71 or 18.5 per cent.

(6) Examined with regard to the immediate results of the treatment on discharge, the after-histories show that in I stage of the patients traced among those discharged as 'arrested' not less than 87.6 per cent. were living five years after, of those as 'much improved' 81.3 per cent. and of those as 'improved' 75 per cent. In II stage the corresponding figures are 83.3, 68.8 and 50.0 per cent. In III stage the number of 'arrested' is too small to calculate as a percentage, while of those 'much improved' 50.0 and of 'improved' 21.4 per cent. were living. It should be remembered, as stated above, that practically all those who are living after 5 years are doing full work.

(7) An improvement of the immediate results of treatment on discharge of the patients in the second five-year group is followed by a corresponding improvement in the after-results.

(8) In the second five-year group the patients, discharged as 'much improved' in the I and II stages,

have been shown to have a chance in life, 5 years after discharge, almost equally as good as that of those discharged as 'arrested' in the same stages. This was not so in the first five-year group. The difference is due to the benefit received by the second group from the later development of modern sanatorium treatment.

Training of doctors and medical students was continued during the year, especially in connection with the Missionary Medical School for Women at Vellore. Two classes were held for training laboratory assistants, and one of the students—Dr. Rachael Deori—was added to the laboratory staff. The laboratory is under the charge of the Rev. R. M. Barton, M.A. (Oxon.), and does a large amount of work.

An important event during the year was the installation of an electric plant to supply electric light and power to the 106 separate buildings and blocks of the sanatorium and 86 road lights. This cost Rs. 50,000, of which the Madras Government found Rs. 20,000; the installation of electric power has enabled the laboratory to be supplied with an electric centrifuge and an electric refrigerator. A second important event of the year was the holding at the Sanatorium of the biennial conference of the Christian Medical Association of India in January 1931.

The total income for the year was Rs. 1,30,994, of which Rs. 84,908 was local income derived from payments by patients, etc. The total expenditure was Rs. 1,26,701. It will thus be seen that the Sanatorium is very largely self-supporting. Its work is one of the few bright spots in the problem of tuberculosis in India.

REPORT OF THE MEDICAL RESEARCH COUNCIL FOR THE YEAR 1930-31. LONDON: HIS MAJESTY'S STATIONERY OFFICE. PRICE, 2s. 6d. AVAILABLE IN INDIA FROM MESSRS. THACKER, SPINK AND CO., LTD., CALCUTTA AND SIMLA; THACKER & CO., BOMBAY; MESSRS. HIGGINBOTHAMS, MADRAS AND BANGALORE.

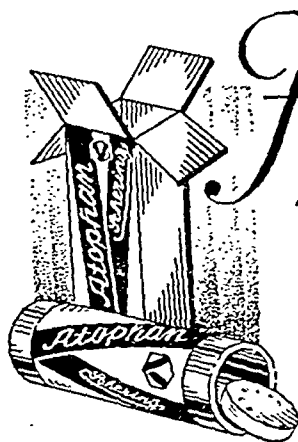
MEDICAL research workers in India will read this fascinating report with mingled feelings of envy and admiration. The parliamentary grant-in-aid for the Medical Research Council for the year was £148,000; to this must be added other monetary grants by individuals and by the Rockefeller Foundation, and large free supplies of new drugs and biochemical preparations by the big chemical manufacturing firms in Great Britain. In all there is provision of a sum of at least 20 lakhs, there are the research workers available, and the result is that the Medical Research Council emphatically 'deliver the goods'; and this for a country with 40 million inhabitants. For India, with 350 million inhabitants, the budget provision at present is 2½ lakhs, research workers are scarce and difficult to obtain, and progress is made only at the cost of very considerable effort and under most difficult circumstances.

The covering report of the Medical Research Council to the Committee of the Privy Council for Medical Research in itself constitutes so able a review of the year's work, that we cannot do better than to abstract from it freely.

New advances in nutritional science

As in almost all the past years of their work, a relatively large part of the expenditure of the Council has been claimed by the rapidly progressive work being done in the new fields of nutritional research, as will be seen at many points in this Report. They have referred to this in so many of their previous Reports to Parliament that special reference to it now may seem unnecessary. But both the scientific interest and the immediate practical value of this part of their work are so great, and seem so clearly to justify any effective expenditure upon it, that the Council could not well omit to draw attention here to some notable progress that the past months have seen.

In their Annual Report for 1926-27 the Council put together an account of the successive advances in



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'status lymphaticus' has no real existence. It was suggested that medical men in many instances have been misled by the absence of properly recorded data of the normal size of the thymus gland, and of common variations about the normal, during healthy life. A man accustomed to the diminished thymus commonly seen in hospitals after death from fever or wasting illness might readily take as abnormal the size of the gland after sudden death in normal states of health and nutrition. Coroners from time to time have publicly expressed their doubts whether any real meaning can be attached to 'status lymphaticus' as providing an adequate cause of death. Even if such an abnormal condition does exist, it has not yet been adequately explained in what manner it can account for sudden death. There is an obvious danger lest the facile use of a verbalism of this kind may serve only to divert attention from the need for fuller inquiry into the actual cause of death. In 1926 the Council, in conjunction with the Pathological Society of Great Britain and Ireland, organized a collective investigation of 'status lymphaticus'. In making arrangements for this they received important assistance from the Home Office and from the coroners. The main objects of the investigation were two: first, to establish by a large series of weights and measurements the standards of weight for age, and proportion to body-weight, of the normal thymus at all ages, and, second, to investigate closely the precise cause of death in persons dying suddenly from unexplained or trivial causes where the only apparent abnormality was the presence of a large thymus. This scheme involved the appointment of a number of investigators in large centres of population in Britain to collect detailed records upon special cards prepared and issued for the purpose. An analysis of the data shows that the inquiry may be regarded as having definitely established within narrow limits the average weights of the normal thymus for the several ages from one year upwards. These are in close accordance with figures based upon data published in recent years by other observers elsewhere. The mean percentage proportions of thymic weight to the body-weight for the different age groups have been similarly established. In the opinion of the Committee, the facts elicited in the inquiry agree with the classical reports published by Hammer in 1926 and 1929 from Sweden, which have met with surprisingly little attention in other countries. They agree also with the statistical results based upon London material supplied by Professor Turnbull and published by Greenwood and Woods in 1927. They provide, as the Committee conclude, 'no evidence that so-called "*status thymico-lymphaticus*" has any existence as a pathological entity'.

Results of insulin treatment

In their Report last year the Council examined in some detail the extent to which the benefits of insulin treatment had been actually brought to sufferers from diabetes in the population at large since its beginning in 1923, and the results of the treatment in reducing mortality from the disease. From data in their possession for the national demand and supply of insulin they were able to show that, although there had been abundant supplies almost from the beginning of manufacture in 1923, the general use of the remedy throughout the country had been advancing only gradually and was still much below the level of maximum need. They had also reason to believe that many patients were not receiving insulin under the conditions of biochemical control and dietetic balance that are necessary to secure results equal to those obtained at the chief medical centres.

Attention was also drawn to the difficulties of interpreting the official figures given for death rates from diabetes in successive years since the introduction of insulin. These death rates were already subject to much fluctuation before that time, and there was evidence that the incidence of the disease had been rising since the war. It was pointed out that the figures were based upon death certificates giving the diagnosis of

contributory as well as of immediate causes of death, and that all deaths of diabetic patients, even if actually due to intercurrent illness or occurring at an advanced age, tended to find a place under the head of this disease.

A more important difficulty was that the effect of insulin is not to give radical cure but to prolong life. The results of the treatment, therefore, were to be sought not in a reduction of the total recorded mortality but in a decrease in the deaths from diabetes in the earlier age groups. This decrease was indeed found to be a large one, although not yet so great as might possibly have been expected. The Registrar-General's figures for England and Wales in 1928—the most recent available—showed that since the introduction of insulin in 1923 the mortality of male diabetics under 55 had been reduced by 37 per cent. and of females by 21 per cent.; in the age group 25—45 the rate for males had fallen by as much as 45 per cent. This important result, however, was masked in the total figures by the concurrent increase in the mortality at ages over 55, due in part to the rising incidence of the disease and in part to the prolongation of lives of diabetic patients who without insulin would have died at an earlier age.

The Council concluded by stating their intention of making special inquiry into the results of insulin treatment at special centres, with a view to determining more precisely the standard of success attainable under the best conditions. This has since been done, and a series of over a thousand cases of diabetes, under treatment at one centre in the period 1925—31, is now being submitted to statistical analysis. Almost all these patients have been receiving insulin, except in the highest age group where many of the cases are of the mild and slowly progressive type which is commonly found in elderly subjects and which can often be more conveniently controlled by dietetic measures alone.

The evidence and findings of this inquiry will be published separately at an early date. It must be remembered that the whole period of experience in treatment by insulin covers only eight years at the most. It may be said here, however, that the figures for young and middle-aged subjects show a great preponderance of cases where good health is still maintained against all expectation based on previous experience. The real gain is much greater than any figures can show. Without insulin the patient, during his brief period of survival, fell soon into a state of ever-increasing and distressing invalidism, under dietetic restrictions amounting almost to starvation. The patient receiving insulin now retains or recovers, in the great majority of cases, a close equivalent of normal health, a full measure of bodily and mental vigour, and the capacity to enjoy a useful and active life.

Organized trials of new remedies

The Council have long had before them the problem of securing in the most rapid and effective way the trial, under competent clinical direction, of new substances or preparations which laboratory experiment may have shown to give promise of therapeutic value. On special occasions in the past, as for instance upon the first introduction of insulin for the treatment of diabetes, of liver extracts for the treatment of pernicious anæmia, or again of 'sanocrysin' and of 'diaplyte vaccine' for the treatment of tuberculosis, the Council have made special arrangements for suitable trials and reports by clinical observers invited to act for them in this way. They think that advantage was brought both to the profession and to the public upon each of these occasions, in different degrees, either by the systematic and rapid confirmation of results gained elsewhere, or by the early appraisal of claims found to have been exaggerated.

The production of new therapeutic agents seems certain to increase rather than to diminish, and the Council have proceeded in the last year to set up a more regular machinery for the organization of clinical trials as need for them may arise from time to time.

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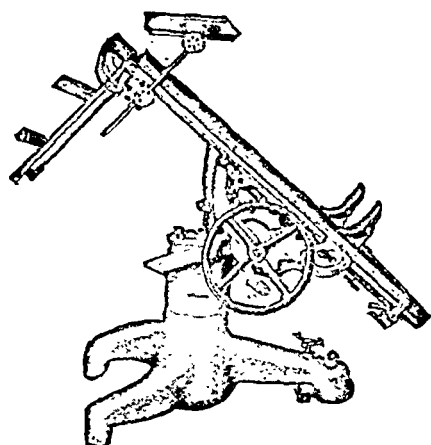


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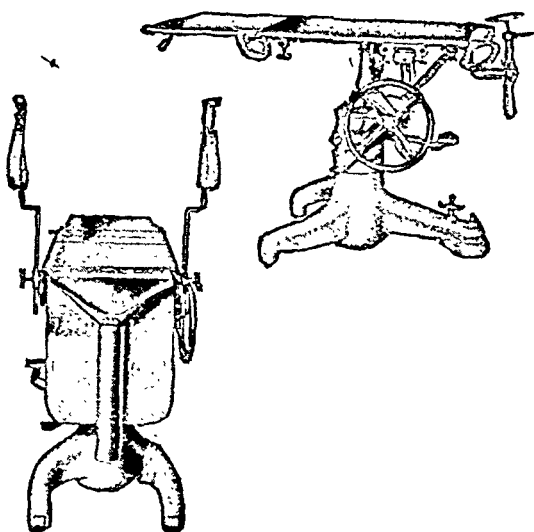
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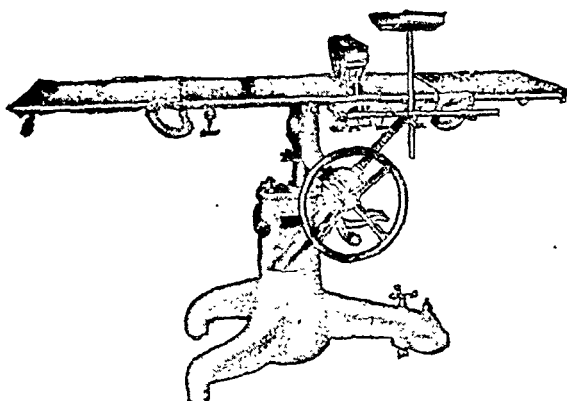
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The Chemotherapy Committee, originally appointed jointly by the Council and by the Department of Scientific and Industrial Research have been engaged in promoting the production of new synthetic substances of therapeutic importance, and in their biological examination. From this Committee new synthetic compounds are put forward from time to time for biological study in the laboratory, or for clinical trial. Other Committees under the Council, for instance, the Sex Hormones Committee, may also be expected to bring to notice biological products for which laboratory experience may call for early clinical appraisal under controlled conditions.

This subject has been approached also from another point of view. The Council have recently had under discussion with representatives of the Association of British Chemical Manufacturers the problem of securing trustworthy clinical trials of products produced by manufacturing firms. It has been urged, and the Council think with much truth, that in this country the work of University laboratories, as well as that of chemical manufacturers, has sometimes failed to gain its proper reward in clinical usefulness because of the practical difficulties that have hitherto prevented early and effective clinical trials. In some other countries and conspicuously in Germany, where the production of new synthetic substances is most active, physicians of good reputation are ready to publish the results of clinical trials of new and patented substances over their own names. In Great Britain, professional men, for reasons that seem obvious here, have not in the same way been willing to use their names. It has been not uncommon, indeed, for a new substance first produced in this country to come into general recognition and use by way of clinical reports published in German or other foreign journals. Members of the medical profession in Great Britain have on more than one occasion had pressed upon their notice, under foreign names by the medium of foreign literature, substances which were British in first production but which have escaped notice and trial by clinicians in their country of origin.

A number of distinguished clinical observers accepted last year the invitation of the Council to form a standing Committee, the Therapeutic Trials Committee, under whose supervision and authority clinical trials of new substances may be organized.

Clinical trials of substances that have been submitted to the Committee and approved for this purpose have already been organized at suitable hospital centres, and are now in progress.

The relations of the Council to manufacturing firms

It has always been laid down and accepted as among the primary functions of the Council not only to promote the stages of scientific discovery as such within the medical field, but also to facilitate the 'availability' of the results of discovery in the interests of the public and the medical profession. It rarely happens that the discovery of a new substance or a new method allows immediate practical use to be made of one or the other. Very often much time and labour must be given, not seldom involving a new series of researches, before the yield of a new substance can be brought into the phase of large-scale production, or a new method be adapted for widespread use. In these intermediate stages of work it is often necessary for rapid and economic progress that close co-operation should be established between the original scientific investigators and those whose work lies in finding the adaptations needed for large-scale production and use. The general social and political reasons that make it obviously desirable for State-supported work like that of the Council to be brought into the field of co-operative effort with British manufacturing firms are reinforced by the intimate relations of this kind of manufacturing to health and life within the country. Apart from any other reasons, it will be accepted as desirable for this nation, as for any other, that all the essential materials for good medical work should be readily procurable within the national boundaries.

The Council have just referred to what they hope will be improved machinery for assisting the British production of new therapeutic substances. They conceive of this as only an added phase of what has been their normal relationship to manufacturing production for many years. Earlier reports of the Council provide several examples of this. The Council assisted by special research work the rapid development in this country of methods of manufacturing insulin, and these led not only to a greatly increased rate of output but also to a rapid fall in cost. They have given assistance in a similar way by the study of methods for the production of vitamin D by the irradiation of ergosterol, for the production of various organic extracts used in medical work, and for the production of material for inoculation against distemper in dogs. At the same time, and from the beginning of their work, the Council have received reciprocal aid in generous measure from the chief manufacturing firms. These have always been ready to offer the results of their experience, the supply of raw materials, or help in other forms.

Publication of a 'System of Bacteriology'

During the past year the publication by the Council in nine volumes of a *System of Bacteriology*, to which more than a hundred British bacteriologists have contributed articles, has been completed. This undertaking was first planned in 1926 after the Council had brought to a close the publication of the monthly journal *Medical Science: Abstracts and Reviews*, which they had previously supported for six years after the war. It was strongly represented to them that pathology would gain by the production of a comprehensive series of concise monographs in bacteriology, each written by an expert dealing with his own subject. In 1929 the Council were able to announce the issue of this projected system, and the publication of volumes began in that year. It fell out that Lord Balfour's last act as Chairman of the Council was his writing the short but brilliant general preface to the whole series, which is printed in Volume I. The Council would express here again their strong hope that the publication of this system may do good service to many workers in many countries who are advancing the sciences of bacteriology and immunology or applying them in the practical fields of human and of animal pathology.

Dr. Paul Fildes, of the London Hospital, and Professor J. C. G. Ledingham, of the Lister Institute, have acted as general editors of this symposium, and they have received other editorial aid in particular sections of the work that has been acknowledged in the several volumes. All those who have so generously given their aid to this project would acknowledge with the Council that by far the heaviest burden of preparation for the work and of other tasks of organization throughout its progress has been borne by Dr. Fildes. Without his devoted work the plan could hardly have been brought to fruition, and certainly the *System* could not have been published punctually within the allotted time. Dr. Edgar Schuster, of the Council's Publications Department, has given indispensable aid throughout at many points. To all these the Council would offer thanks, both on their own behalf and in the name of the innumerable workers who will benefit by this production.

Publication of 'Nutrition Abstracts and Reviews'

The Council have been enabled, by the completion of the *System of Bacteriology*, to bring financial aid to another publication. They have joined with the Imperial Agricultural Bureaux Council and the Reid Library of the Rowett Institute, Aberdeen, in supporting a new periodical, to be known as *Nutrition Abstracts and Reviews*. The preparations made earlier in the year allowed the production of the first number to be announced for November 1931. The results of scientific work in the field of nutrition are contained within a great variety of technical journals. Some appear in journals of biochemistry, others again in those of physiology and other biological subjects, others again

in the medical press and various trade periodicals. That is true of papers relevant to human nutrition, and the same dispersement is even more characteristic of papers directly or indirectly related to the nutrition of livestock. On purely scientific grounds it is obvious that all workers in this field, whether from the medical or from the agricultural point of view, have greatly to gain by the free communication of ideas, methods, and results. Since the primary object of agriculture is to provide nutriment for human beings, there is an even closer practical *nexus* to be observed between the two directions of work. The Council feel confident, therefore, that this new periodical will do much to facilitate the advance of knowledge in this large common field of activity, of which the proper development has unsurpassed interest and practical value among biological subjects.

The report of the Medical Research Council is followed by more detailed reports from the different institutions concerned. The report from the National Institute for Medical Research largely expands in detail that by the Research Council, and deals largely with virus diseases. Studies by filtration methods and ultra-violet photography show that the virus of infectious ectromelia consists of organisms resembling submicroscopic cocci with a diameter of some 0.13 to 0.14 μ . The particles of the virus of foot and mouth disease are smaller—0.008 to 0.012 μ . These sizes are so close to that of colloidal particles that the question may be asked as to whether such particles can be of the nature of living matter, and whether they may not be enzymes instead of bacteria-like organisms. Progress is being made in the study of vaccinia virus, and it should soon be possible to obtain this virus in a state of purity. Widespread use of the new vaccine against dog distemper shows that this is of very great protective value, and it is now available on a commercial scale.

With regard to protistology, Mr. Dobell has completed his experimental study of *Entamoeba coli* and *Endolimax nana*. The chief result is to show that several known forms of both these species are identical in man and in the macaques, as was previously shown for *Entamoeba histolytica*. The three common intestinal amœbæ of man are thus shown to occur naturally in this genus of monkeys. The results are being prepared for publication.

The experimental work with *Entamoeba histolytica*, mentioned in earlier Reports, has given opportunity for studies, still in progress, of the morphology and behaviour of various strains of the organism under different parasitic and cultural conditions. It has already been shown that its life-history can be profoundly modified by the nature of the associated bacterial flora. In cultures, at any rate, encystment can be induced or prevented by appropriate changes of the accompanying bacteria. These phenomena, with their bearing on the life-history and control of this dangerous human parasite, offer problems of great complexity and interest, towards the solution of which promising progress has been made.

An intestinal species of *Trichomonas* from macaques has been shown to be capable of living in man, and it seems probable that, as in the case of the amœbæ, the same species is common to both. This intestinal flagellate has also been shown to be capable of living in the vagina of *Macacus sinicus*, and this supports the view that the trichomonads of the human intestine and urinogenital organs are really all of one species, though different specific names (*T. hominis* and *T. vaginalis*) have been applied to them. A paper on these flagellates will be published shortly.

Mr. Dobell has also continued his work on the ciliate *Balantidium coli*, from man, and its conjugation in artificial cultures, and has completed his study of the development *in vitro* of another intestinal amœba, *Dientamoeba fragilis*.

Dr. Ruth Svensson, who has been for some years engaged in a survey of the human intestinal protozoa in Sweden, has spent some weeks in the Institute

during the year, for consultation with Mr. Dobell during the preparation of a report on her results.

A very important series of investigations are those in the department of clinical research at University College Hospital, London, under Sir Thomas Lewis. Here again an abstract of the report may be given.

Observations upon the peripheral circulation, and especially upon disturbances of this seen in patients, have continued during the year. Sir Thomas Lewis, with Dr. Landis, has investigated acrocyanosis and concludes that this condition is due not to obstruction on the venous side as some have thought, nor to structural change, but essentially to obstructive spasm in the arterioles of the affected area of skin. The spasm is shown to be brought about locally, and is not due to increased vasomotor tone. Dr. Landis has extended his readings of micro-capillary pressure to Raynaud's disease and has been able to show that, during the stage of spasm, the capillary pressure is low. The pressure rises, however, when the veins of the arm are deliberately congested, and falls abruptly when this venous pressure is abruptly released. These observations supplement previous evidence that the obstruction in Raynaud's disease lies on the arterial and not on the venous side.

Supplementary observations on the reactions of the vessels of the human skin to cold have been made by Sir Thomas Lewis. The relative cooling of different parts of the skin of the hands and face in subjects exposed out of doors has been ascertained, and the expectation realized that the degree to which a part cools corresponds in general with its susceptibility to maladies attributable to cold, such as frostbite and chilblain. It has been shown, further, that the vasodilatation which occurs as a local response to considerable cooling in laboratory experiment, also occurs under more natural conditions of cooling out of doors; the reaction therefore tends, in natural circumstances, to guard exposed parts from injurious cooling. The reaction is more certain if the body as a whole is kept warm.

Sir Thomas Lewis and Dr. Landis have published a long series of observations upon a type of Raynaud's disease complicated by scleroderma. These observations show that, as in uncomplicated Raynaud's disease, the vascular defect is a local one and is not brought about by vasomotor influences of the nervous system. Special tests applied to the living subject indicate that in many cases of Raynaud's disease structural change has occurred in the digital vessels, a change that contributes to the circulatory manifestations of the disease.

A report has been made by Sir Thomas Lewis upon cases of angina pectoris of a peculiar type, in which the blood pressure and the pulse rate rise during the attacks of pain. It has been found that the pain in these attacks succeeds the circulatory disturbance and does not cause it; at the same time there seems to be no precise relation between the work of the heart and the occurrence of pain in the attack, which indicates that the coronary vessels of the heart themselves participate in the general vasomotor storm. This form of angina is particularly susceptible to the action of amyl nitrite; the effects of the drug are not to be ascribed to simple lowering of blood pressure, but in part, if not in chief part, to dilatation of the coronary vessels. This type of angina is contrasted with the totally distinct 'vasomotor angina' described by Nothnagel.

Sir Thomas Lewis, Dr. Pickering, and Dr. Rothschild have investigated the production of a variety of pain associated clinically with 'intermittent claudication'. They have been able to reproduce a precisely similar pain by exercising a normal limb with its circulation arrested, and to show that vascular spasm, often regarded hitherto as the cause of the pain, does not occur. They have found that the times of beginning and intolerance of the pain are remarkably constant under given conditions of exercise. Using these times as indices, they have shown that the stimulus to pain is related to the amount of exercise undertaken, and that the severity of the pain continues unchanged if exercise is stopped but the circulation remains arrested. On the basis of

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Service Notes

APPOINTMENTS AND TRANSFERS

THE Viceroy and Governor-General has been pleased to make the following appointment on His Excellency's personal staff:—

To be Hon'y. Surgeon.

Colonel Sir Frank P. Connor, *Kt.*, *D.S.O.*, *vice* Colonel H. M. Mackenzie, retired. Dated 14th May, 1932.

Lieutenant-Colonel D. P. Gail, Officiating Inspector-General of Civil Hospitals, Punjab, is confirmed in that appointment, with effect from the 14th May, 1932.

Lieutenant-Colonel M. A. Nicholson, an Agency Surgeon, is posted as Chief Medical Officer in Central India and Residency Surgeon, Indore, with effect from the 24th April, 1932.

On return from leave the services of Lieutenant-Colonel J. A. Sinton, *v.c.*, *O.B.E.*, are placed on foreign service under the Indian Research Fund Association, with effect from the 4th April, 1932, for appointment as Director, Malaria Survey of India, Kasauli.

The services of Lieutenant-Colonel F. A. Barker, *O.B.E.*, Inspector-General of Prisons, Punjab, are replaced at the disposal of the Punjab Government, with effect from the forenoon of the 22nd April, 1932.

Major J. J. Rooney, an officiating Agency Surgeon, on return from leave, is posted as Residency Surgeon, and *ex-officio* Vice-Consul, Bushire, with effect from the 23rd April, 1932.

Major J. G. Bird, an officiating Agency Surgeon, is posted as Residency Surgeon, Mewar, with effect from the 19th April, 1932.

The services of Major W. J. Webster, *M.C.*, an officer of the Medical Research Department, are placed temporarily at the disposal of the Government of Madras for appointment as First Assistant Director, King Institute, Guindy, with effect from the date he assumes charge of his duties.

The services of Major R. H. Malone are placed temporarily at the disposal of the Government of Burma, with effect from the date he assumed charge of his duties under the local Government.

Major J. R. Katariya is appointed Officiating Ex-Officer, Jhansi Cantonment, in addition to his ordinary duties, *vice* Lieutenant-Colonel P. G. Benson-Cooke, appointed Offg. I. O., M. L. & C., Eastern Command. Dated 1st May, 1932.

The services of Captain R. Linton are placed temporarily at the disposal of the Government of Bengal, with effect from the 14th April, 1932.

Captain H. W. Mulligan, an officer of the Medical Research Department, on reversion from foreign service under the Indian Research Fund Association, is appointed to officiate as Assistant Director, Central Research Institute, Kasauli, with effect from the 4th April, 1932.

Captain J. J. Beausang is appointed temporarily to officiate as an Agency Surgeon and is posted as Medical Officer and *ex-officio* Vice-Consul, Sistan, with effect from the 23rd April, 1932, and until further orders.

The services of Captain J. F. Shepherd are replaced at the disposal of His Excellency the Commander-in-Chief in India, with effect from the 4th April, 1932.

The services of Captain G. F. Taylor, an officiating Agency Surgeon, are replaced at the disposal of His Excellency the Commander-in-Chief in India, with effect from the date of expiry of his leave.

Captain V. A. Edge is appointed to be Senior Medical Officer, Port Blair, with effect from the 21st May, 1932, or any subsequent date on which he assumes charge of his duties.

LEAVE

Colonel H. M. Mackenzie, *V.H.S.*, Inspector-General of Civil Hospitals, Punjab, is granted leave, preparatory to retirement, on average pay for 1 month and 14 days, with effect from the 30th March, 1932.

Lieutenant-Colonel R. F. D. MacGregor, *M.C.*, an Agency Surgeon, is granted leave for 6 months, with effect from the 24th April, 1932.

Lieutenant-Colonel M. J. Holgate, *O.B.E.*, Civil Surgeon and Superintendent, Medical School, Hyderabad, and Mental Hospital, Hyderabad, is granted leave for 13 weeks and 4 days, with effect from 26th May, 1932, or subsequent date of availing.

Major R. V. Martin, officiating Inspector-General of Prisons, Bombay Presidency, is granted, with effect from the 16th April, 1932, or the date of his relief, leave for 12 months.

Major F. R. Thornton, *M.C.*, Civil Surgeon, Coorg, is granted leave on average pay for 7 months and 20 days, with effect from the 29th March, 1932, with permission to prefix the Easter holidays to his leave.

Major H. J. H. Symons, *M.C.*, an Agency Surgeon, is granted leave on average pay for 5 months, combined with study leave for 3 months, with effect from the 23rd April, 1932.

Major B. G. Mallya, Police Surgeon, Calcutta, is granted leave on average pay for 8 months out of India and Ceylon; and study leave for 2 months, with effect from the date on which he is relieved.

Captain G. F. Taylor, *I.M.S.*, an Officiating Agency Surgeon, is granted leave on average pay for 5 days, combined with furlough for 2 months and 21 days and leave on medical certificate for 6 months, with effect from the 25th December, 1931.

PROMOTIONS

Captain to be Major

W. H. Crichton, *I.M.S.* Dated 23rd April, 1932.

RETIREMENT

Lieutenant-Colonel S. W. Jones, *O.B.E.*, *I.M.S.*, retires 3rd April, 1932.

Notes

A DEVICE FOR PREVENTING GLARE IN ELECTRIC OPHTHALMOSCOPES

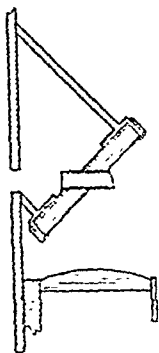
By N. BISHOP HARMAN, *F.R.C.S.*

THE introduction of the electric ophthalmoscope has greatly increased facilities for the examination of the interior of the eye, but the internal position of the source of the illumination within the instrument has produced certain new difficulties which the older reflecting ophthalmoscope did not possess. The electric lamp within the stem of the electric ophthalmoscope throws a beam of light parallel to the instrument, and this beam must be bent at right angles to enter the eye of the patient. Prisms and mirrors of various designs have been used to effect this bending. The desideratum is such a complete bending of the rays of light into the eye of the patient that the surgeon has a clear peep-hole through the instrument along the beam of light, and free from all disturbance such as will be caused by rays of light that may be diverted backwards from the instrument so as to reach his own eye. If there are such aberrant rays the surgeon cannot see the fundus clearly by reason of the haze that is caused by the rays. The effect is somewhat similar to that disturbance to visibility produced by the rays of the head lamps of a car when there is a slight mist at night. These disturbing effects have become more evident with the increase in the power of the light available.

The aberrant rays are brought about by several conditions. If a glass mirror with a drilled hole be used in the ophthalmoscope the beam of light will impinge upon the upper edge of this hole, and no matter how it may be blackened, this edge will scatter a blaze of disturbing light. If the mirror has no drilled hole but only a gap in the silvering, the hinder surface of the

glass itself will reflect any light that may fall upon it from above the ophthalmoscope, and the slightest imperfection in the glass or dust upon it will increase the disturbance.

To overcome this defect, Marple cut out the upper edge of the mirror and used one of U shape. It was very successful, but the mirror was too fragile. A



Section through mirror fitted with glare shield.

polished stainless mirror of U shape was substituted, but this has two drawbacks in that it has a lower reflecting power, and soon scratches, still further reducing the amount of light reflected. Prisms, such as were used in the first ophthalmoscopes, avoided some of the difficulties, but if they are well designed they are costly and permit very little variation of the beam, while the inexpensive ones are inefficient.

Recently, in discussing electric ophthalmoscopes with Mr. J. W. Tudor Thomas of Cardiff, he told me that there had come into his possession an instrument, the origin of which he did not know, which was free from these defects. A small tube had been fitted into the drilled hole of the glass mirror. This device is the simplest, most natural and effective correction of the one difficulty of the electric ophthalmoscope. It does exactly what we instinctively do to protect our eyes from the glare. We shield them with our hands, or with hat-brims, or we fit vizors to the wind screens of our cars.

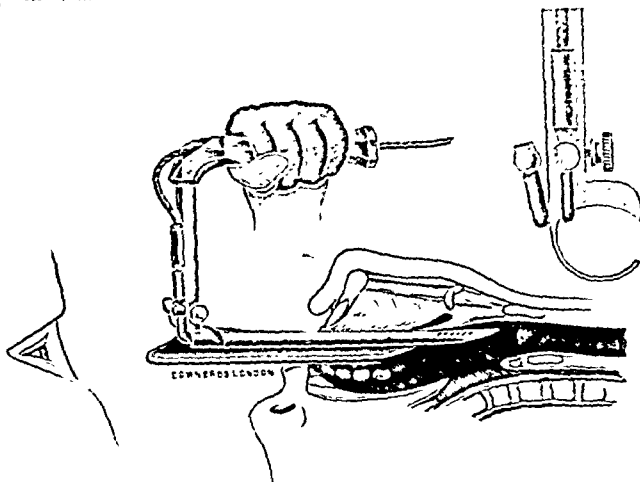
A small thin-walled tube is mounted within the hole of the mirror of the ophthalmoscope, the forward end of the tube is cut at an angle so that there projects from the hole of the mirror a crescentic ledge or shield. This shield fits the lower edge of the drilled hole and projects just sufficiently to cast a shadow over the hole. When the shield is in position no aberrant rays can be diverted into the surgeon's eye and he gets a perfectly clear view into the patient's eye. For a mirror set at an angle of 45° to the beam from the lamp and a hole of 2 mm. diameter, the shield fitted to the lower edge of the hole must project 2.5 mm. to provide complete protection. The shield is made of metal and is fitted to the metal bed-plate of the mirror, but is independent of the mirror glass, so that it is secure and not likely to be broken. Also the mirror glass can be detached without disturbing the metal shield.

One small difficulty arose in the use of the device. When the beam from the lamp was exactly centred to the mirror, it was found that the shield cut out the focussed rays when they met at the position of the shield. This difficulty was overcome by slightly decentering the lamp, so that the beam when exactly focussed on the mirror impinged upon it to one side of the drilled hole. This decentering has no drawback. Messrs. Rayner and Keeler of 100, New Bond Street, London, W.1, have fitted this shield to the new electric ophthalmoscope made by them for me. The device is a real advantage, and it will be the standard pattern. It has been fitted to other instruments, and has effected a great improvement in each case.

AN ILLUMINATED DIRECT LARYNGO-PHARYNGOSCOPE

By E. WATSON-WILLIAMS, M.C., F.R.C.S.

THE instrument here described I have been using for a considerable time, and have found that it presents definite advantages. It is longer than the usual pattern, and adequate for the largest adult; but owing to the tapering of the end, is convenient for children of two years old. It gives very good exposure for examination of or operation on the larynx, and the tip can be passed between the vocal cords; it is useful also as an upper oesophageal speculum, and will reach all foreign bodies in the common site of impaction, immediately below the cricoid: the slotting of the ventral surface near the tip enables the patient to respire through the lumen during such use. The right side of the 'tube' has been cut away completely, facilitating the passage of instruments. An anæsthetic tube is built into the left



wall, abolishing the need for a separate anæsthetic tube, and delivering the vapour well down the lumen. The 'tube' of the instrument is of stainless steel, 20 cm. long, and 16×20 mm. internal diameter; the right wall is absent, a slot of 1 cm. wide being left. Commencing at 8 cm. from the tip the width is gradually tapered to 8 mm. at the tip, which is blunt; at the same time the ventral wall is discontinued, so that the distal 5 cm. is definitely a concave spatula, the concavity gradually lessening toward the tip. Illumination is by means of a Jackson-type lamp carrier, taking the standard lamps (2.5 m-amp.), which are carried at the distal end. The handle is also of the Jackson type, but hollow, so that the lamp-flex is carried well away from the upper end during use.

Messrs. Down Bros. Ltd., London, are the makers of the instrument.

'RADIOSTOL, B. D. H.'

A BROCHURE recently published by the British Drug Houses deals with their product 'Radiostol, B. D. H.'—an irradiated ergosterol. This is an entirely British product first placed on the market in 1927, and is in effect a standardised solution of vitamin D. Since that date, however, much research work has been carried on with regard to vitamin D, and we are now in a much better position to judge the indications for its administration.

In 1931 workers at the National Institute for Medical Research at Hampstead succeeded in isolating vitamin D in a state of purity, the pure vitamin being given the name of 'Calciferol'. It is a white substance of definite crystalline structure, giving the same empirical formula as ergosterol. 'Calciferol' is now produced on the manufacturing scale by the British Drug Houses.

It is claimed that 'Radiostol' is standardised in terms of the standard preparation of irradiated ergosterol

issued by the Medical Research Council which contains 1,000 units of vitamine D activity per c.c.m. This standard has recently been adopted by the Permanent Standards Commission of the Health Organisation of the League of Nations. The normal function of vitamine D is to control calcium and phosphorus metabolism, and it is now established that correct calcium and phosphorus metabolism is possible only when the available vitamine D is adequate.

The only ordinary articles of food which contain vitamine D are milk, butter, and eggs, and it is present in these only in very minute and variable quantities: it is also produced in minute traces by the action of the sun's rays on the skin. In many instances, however, the supply from natural sources has to be supplemented by such preparations as Radiostol. The administration of Radiostol is indicated in the prevention and correction of all manner of skeletal defects in children. In adults it is chiefly indicated in osteomalacia and to accelerate the healing of fractures. A report in 1931 by the National Council for Medical Research demonstrates the possibility of the control of dental caries in children by the daily administration of standardized amounts of vitamine D in the form of Radiostol. Lastly, its administration to nursing mothers is indicated in order to ensure the correct development of bones and teeth in their infants.

'Radiostol, B. D. H.' is put up in the form of solution for administration to infants; also as pellets for administration to adults.

MERCK'S ANNUAL REPORT, 1931. PART III

THE recent publication of the third part of Merck's annual report for 1931 is of considerable interest, for it contains several articles of clinical interest. A new and imposing building was opened during the year for chemical research and a full account of this is given with photographs. The building housing the new chief laboratory covers an area of more than half an acre, whilst the library contains some 15,000 volumes. A special need was the provision of small individual laboratories for one or two research workers in place of larger ones for more general work, and this has been met by the inclusion of 22 such individual laboratories, 30 X 20 feet. On the other hand there are 11 general experimental rooms, and 4 large rooms fitted for extensive experiments. Many rooms are fitted for special research work, such as hydrogenation-laboratories and rooms for optical and physical investigations.

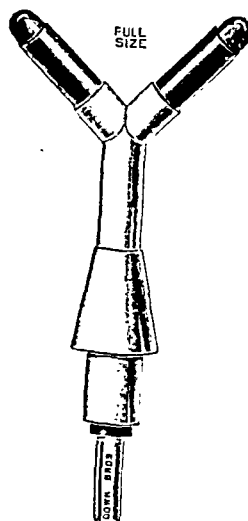
Other interesting articles in the report include one on oral cholecystography by repeated administration of the contrast medium by Dr. Carl Sandstrom; on Eupaverin in the treatment of acute biliary colic by Dr. Viktor Stark; on further experience in the study and modern therapy of pernicious anaemia by Dr. Kurt Wolff; and one on the treatment of acute convulsive attacks in infants and young children by Luminal-sodium and Luminal solution by Dr. Philipp Leitner. A general pharmaco-therapeutic review and abstracts from medical literature complete the report.

AN ELECTRIC FITTING FOR TESTING TEMPERATURE SENSATION

By DR. H. WOLFE CORNER, M.D.

THIS consists of a neat plated metal piece, forked at one end to carry two special blackened electric lamps and a fitting at the other end to slip into the ordinary ophthalmoscope type of battery handle. One of the blackened lamps can be heated from the battery while the other remains cold. The heated surface is sufficiently large to give a definite area of fairly high

temperature while the contrast between the two—hot and cold—is readily appreciated.



It is specially designed to be always available, easily carried inside the ophthalmoscope case, of no great weight nor size, and is extremely valuable in just those cases where the more accurate determination of temperature sense is required.

The makers are Messrs. Down Bros., Ltd., St. Thomas's Street, London, S.E.

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Original Articles

THE ANÆMIA OF PREGNANCY*

By N. GUPTA, M.B., M.R.C.P. (E.), D.P.H. (Camb.),
D.T.M. & H. (Lond.)

Department of Pathology, Medical College, Calcutta

AMONGST recent papers on the ætiology of this obscure disease, one may mention those of McSwiney (1927), of Balfour (1927, 1929), the work of Wills and Mehta (1930) and of Wills (1931)—largely relating to dietaries, and of Maitra (1931).

This anæmia occurs in Bengal as a distinct disease associated with pregnancy. The usual causes of tropical anæmia are ancylostomiasis and other helminthic infections, malaria, leishmaniasis, dysentery, tuberculosis, syphilis and sprue, all responsible, more or less, for tropical anæmia. The extent to which one or a multiplicity of these diseases are involved in the ætiology of pregnancy anæmia is an important question which will be discussed in detail.

There is certainly a large group of cases where the above-mentioned factors are wanting. The condition of pregnancy seems to be essential and not a mere accident in this malady.

The symptom-complex, the blood picture, the course of the disease and the dramatic end of these cases, the morbid anatomy and histopathology are invariably the same. What I saw of this ailment in 1920 when I was first attached to the Eden Hospital was also true in 1931.

It is a disease in entity as distinct as pernicious anæmia of the Combe-Addisonian type. These will perhaps cease to be distinct disease groups when an ætiological factor or factors common to both can be found out.

Clinical features.—A fully developed picture of anæmia complicating pregnancy makes as indelible an impression on the mind of an observer as does that of a pernicious anæmia. The face is pale and the conjunctivæ white; the whole surface of the body has a flabby œdematous appearance. The emaciation is much less than one would expect from the degree of the anæmia. Puffiness of the face and œdema of the feet and ankles, in fact a generalised œdema is seen in a fair number of cases. Some of them are remarkably sthenic and can easily carry on ordinary household duties, but much strain or any attempt to climb up a staircase will cause palpitation and breathlessness. Early digestive disturbances are commonly noticed. The tongue is glossy and flabby, soreness of the tongue is noticed

in some patients but is not constant. Diarrhœa is a common complaint. The pulse tension is considerable but compressible. Blood pressure is low. Most of the cases suffer from a slight rise of temperature.

The picture drawn above is typical of 'pregnancy anæmia' in Bengal. It occurs in all communities, both in villages and towns, amongst Hindus, Mohammedans and Christians. The urban districts suffer more than rural areas. The so-called middle class women and poorer classes of Bengal suffer more than the better and richer classes of people. Anglo-Indians and Jews suffer less in proportion as well as in severity than do other communities. Europeans are practically unaffected.

Number of cases and the condition of patients on admission

The present series consists of 203 cases; all of them were admitted into the Eden Hospital as indoor patients during the period August 1928 to July 1930. Most of them were admitted in the last trimester at or near full term. Opportunities were available to study the cases in detail, but most of them left the hospital at their own risk as soon as a slight improvement was noticed, as their presence at home was urgently required. A few remained longer, for a cure, but the hospital accommodation was insufficient to allow them to remain in hospital for a longer period. This constituted one of the principal difficulties in a 'follow-up' of the cases and in ascertaining the end-results of treatment. This series also included a few cases complicated with secondary infections, such as malaria (2 cases), ancylostomiasis (2 cases), amœbic dysentery (1 case), syphilis (15 cases). It will be seen that the anæmia of the patient was hardly improved during pregnancy at the third trimester even after amelioration of the secondary infections.

The hæmatological findings in anæmia of pregnancy

The changes in the blood are an important feature of the disease and are essential for making an accurate diagnosis.

The grade of anæmia met with in this series of cases is tabulated conventionally in 3 groups:—

(i) *Group I* includes cases where the red cell count was 1,000,000 per c.mm. or less—36 cases recorded.

(ii) *Group II* includes cases where the red cell count was between 1,000,000 and 2,000,000 per c.mm.; 114 cases recorded.

(iii) *Group III* includes cases where the red cell count was between 2,000,000 and 3,000,000 per c.mm.—53 cases recorded.

The mean average red cell count of the above three groups was 1,530,000 per c.mm., the average colour-index was 1.1, and the average leucocyte count was 7,485 per c.mm. (excluding

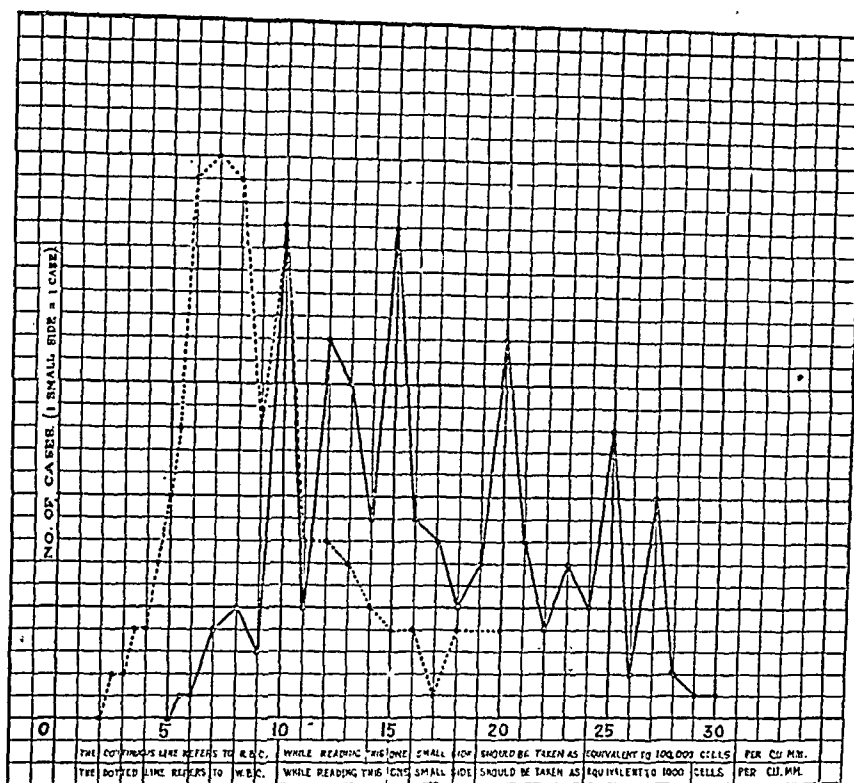
* Being a paper read before the Calcutta branch of the British Medical Association on 12th December, 1931.

cases with high leucocytosis). Graph I represents red cells and leucocyte counts. This includes all cases and even those with high leucocytosis; an average increase of leucocyte count is represented.

the corpuscles seems generally greater than normal.

Macrocytosis is not easily detected. In fact, macrocytes have been missed except in a few cases which were of a definitely megalocytic

GRAPH I



Graph I represents red cells and leucocyte counts.

The average blood conditions of pregnant Bengali women of the hospital class was studied in 55 cases to find its relative significance in connection with anæmia in pregnancy.

The average red cell count of this class of women was 3,000,000 per c.mm. and the average percentage of hæmoglobin 55 per cent. The colour-index was 0.9. The average white cell count was 7,000 per c.mm. and the average reticulocyte count was 1 per cent.

Blood picture and reticulocyte count in the anæmia of pregnancy

The morphological changes in the blood picture have been observed in cases of profound anæmia, and also contrasted with those of cases approximating to the normal average of the hospital class of patients. The outstanding feature is the decrease in the red cell count which is sometimes so low as to give a peculiar watery appearance of the blood which is very familiar to us. Anisocytosis, poikilocytosis, polychromatophilia were observed in 74.3 per cent. of cases. Punctate basophilia was observed in 20 per cent. of cases. Normoblasts or pronormoblasts were seen in 25 per cent. of cases.

True megaloblasts were seen in 0.4 per cent. of cases. The mean variation in the size of

character. In doubtful cases the method suggested by Lowy was adopted. All these features show an active regeneration of the marrow. Evidences of corpuscular regeneration are thus found due to hyperplastic changes in the bone-marrow. Anomalies of cell reproduction are also met with.

Only a few cases responded by an increase in the reticulocyte count after liver diet. The total average increase in those cases responding to liver treatment was 5 per cent. only.

The response to liver diet is thus not similar to that in the 'pernicious type of anæmia'.

Red cells, hæmoglobin and colour-index

The number of red corpuscles and the amount of hæmoglobin do not decrease equally. The average colour-index as stated before was 1.1. A high colour-index supports the macrocytic nature of anæmia in this ailment. It is to be seen, however, that high colour-indices are not present in every case in this series. The hæmoglobin value was taken by Sahli's method or modified Sahli (Hellige).

White cell count.—Unlike the leucopænia in 'pernicious anæmia' there is leucocytosis in our series of cases. The average white cell count was 7,430 per c.mm. There was also an average relative increase in the percentage of

neutrophiles. Fifty-six per cent. of cases showed an average increase of neutrophiles to 70 per cent. in the differential counts.

Leucocytosis as a physiological condition is seen in pregnancy. In our control series, the average leucocyte count was 7,000 per c.mm.

Platelets. The general appearance of the slide shows a decrease in the number of platelets. Platelets are not enumerated and are not shown in the blood count.

Wassermann reaction. This was positive in only 8.5 per cent. of this series.

Bacteriology of urine and fæces in cases of anæmia of pregnancy

In the examination of the urine, 25 per cent. of our cases in this series showed albumen. Colon bacteria were recovered from the urine in 50 per cent. of post-natal cases. Antenatal cases were practically free. Five per cent. of the positive cases were found hæmolytic. Atypical strains of this group were also encountered in a few cases. Fæcal streptococci (enterococci) were often seen.

The routine of urine culture is to centrifuge a catheter sample for about ten minutes till all sediment deposits at the bottom. The supernatant fluid is thrown off and a drop of the deposit is plated on (a) MacConkey's medium, (b) a loopful is plated on bromeresol purple-lactose agar, (c) a small amount is inoculated on saline agar surfaced with a thick layer of 5 per cent. defibrinated human blood.

A wet preparation gives information regarding (i) motility of the bacteria, (ii) the presence of pus cells, (iii) casts or crystals, (iv) or any other abnormality.

Three smears are prepared, one on a cover slip mounted in 1:5 methylene blue, blotted, then is instilled a drop of 0.5 per cent. acetic acid, to study the morphological characters in detail, the second smear is treated by Gram's method, and the third stained for acid-fast bacilli.

It is a wrong idea to think that colon bacteria cannot be recovered from an alkaline urine; pus cells are absent in a case of simple bacilluria. Those strains which morphologically appear like pneumococci are really enterococci. It is difficult to suppose that this disease is associated with any particular variety of these bacteria.

The efforts to study the fæcal flora were directed to the discovery of specific pathogenic organism. Technical details were followed after Davidson.

Except in some isolated individuals, the strains of bacteria recovered from the intestinal flora do not differ from those found in healthy persons.

The fæcal flora of ten healthy women, on an average Bengali diet, were examined to compare the findings with those in anæmia of pregnancy.

It was found that the total number of bacteria was greater in anæmia cases than in normal women. Further light could not be gained and I found it hopeless to classify them on a really informative basis.

Atypical colon bacilli were encountered in a few cases. A group of non-lactose fermenters (*B. carolinus*, *B. asiaticus* and others) and late-lactose-fermenters were met with. None of these strains were found to be hæmolytic.

Streptococci were classified on biological methods into hæmolytic and non-hæmolytic, and further differentiated into broader groups by fermentative tests. A number of anaerobic streptococci were also met with.

Selection of culture media for the urine was the same as that in our routine examination of fæces. Bromeresol purple lactose agar as recommended by Moench Kahn and Torrey was found suitable, particularly for enterococci, as it is sensitive to colour change. They appear as small colonies, fairly thick with a light yellow periphery and a dark centre. They are ovoid in shape, of short chains, can resist temperature to 60°C. for 20 to 30 minutes. They grow in MacConkey's media (bile salt media) and give a general turbidity in broth with a very little deposit. They ferment lactose, salicin and mannite.

The other streptococci, including enterococci encountered in the fæcal flora, were all inert to blood.

Long-chained streptococci of the *salivarius* group were met with. They do not grow in bile salt media.

Ten cases were examined for *B. welchii* and two of them were found positive. The method adopted for this purpose was William and Blair's modification by Davidson. Opportunities were not available to examine systematically the gastro-intestinal flora in different trimesters, and also to follow the changes after pregnancy. From the analysis of the results no causal organism with approximately the same frequency of incidence in each case could be found.

In our everyday routine work we meet with atypical colon bacteria like *B. carolinus* and others, or a few hæmolytic strains of *B. coli* or *Sr. salivarius*. None of them appear invariably in our series of cases. All that can be said is that the fæcal flora is different quantitatively from that of the normal healthy individuals.

The same thing may happen in pregnancy with the uterus pressing more or less on the surrounding tissues, particularly the large intestine.

It has been demonstrated that these patients do not suffer from achlorhydria (Lucy Wills) and so any infection from the upper alimentary tract is apparently not possible; the acid gastric contents kill any bacteria swallowed.

The possibility of extension from the colon to the higher level of the small intestine is much

more feasible. Lieut.-Col. Acton also believes in intestinal sepsis as a factor.

The bacteria normally present in the intestine under such conditions may behave pathologically and result in entero-colitis, as frequently manifested in these cases. They behave as extrinsic factors only.

It is a well established bacteriological belief that each disease is caused by one species of organism, but our examination of the faecal flora has failed to find any such bacterium.

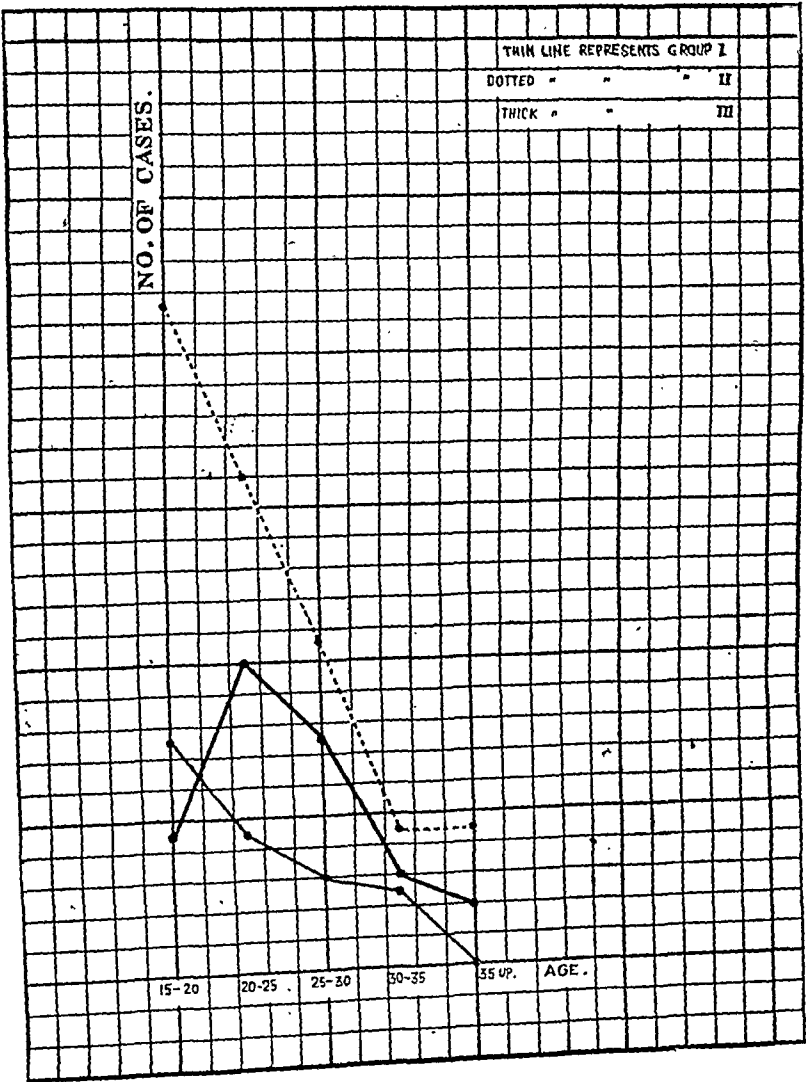
however, observe strict purdah and are reluctant to seek admission to hospitals, and so a smaller percentage of this community is shown in this series. An average percentage of the different communities suffering from different grades of anæmia is shown below :—

Hindus	..	..	57.9 per cent.
Mohammedans	..	..	10.24 "
Indian Christians	..	..	27.5 "
Anglo-Indians	..	..	3.13 "
Jews	..	..	1.23 "

Incidence of the disease in different communities

	Europeans	Anglo-Indians	Indian Christians	Hindus	Mohammedans	Jews	Total
Number of cases admitted (August 1928 to July 1930).	73	1,022	244	1,304	110	68	2,821
Number of anæmia cases during this period.	..	8	55	116	21	3	203
Incidence, proportion ..	..	127.8	4.4	11.4	5.2	22.6	13.8

GRAPH III



Graph III represents age incidence.

Communities.—All communities are admitted to the Eden Hospital, but Mohammedans

Graph II represents the number of cases, in columns, and the correlations of the different

communities suffering from the different grades of anæmia (Groups I, II and III).

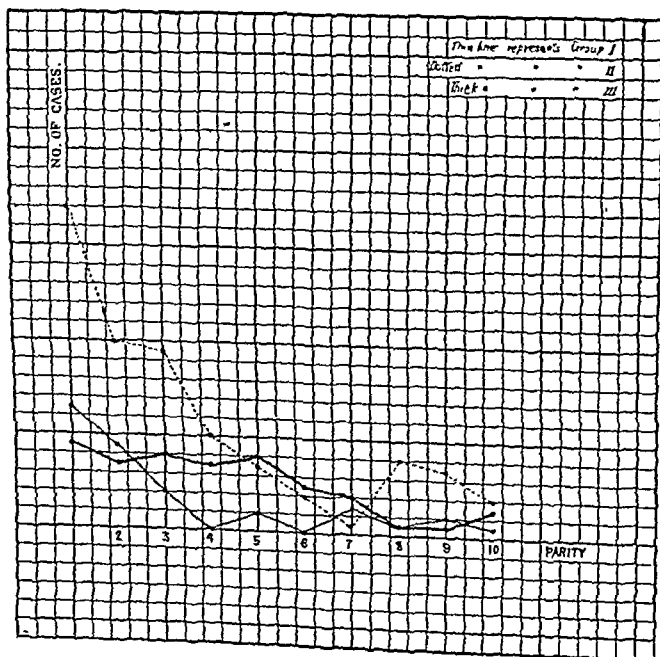
The number of Hindus admitted to the Eden Hospital is highest, the percentage of Hindus suffering from anæmia is greater than the other communities and more so in Group I (i.e., the severest grade of anæmia). The Anglo-Indians and the Jews suffer less in proportion as well as in severity, as they seek early antenatal care.

The Indian Christians too, attend antenatal clinics at the out-patient department more than do the Hindus and the Mohammedans. Their percentage is highest in Group III, i.e., the low grade of anæmia.

Unlike Hindus and Mohammedans, the other communities possibly do not wait for severer symptoms but seek admission whenever any complaints appear during pregnancy.

It should be mentioned that the hospital admitted more cases with anæmia of pregnancy during this period in order to study this ailment particularly, and so the incidence of the disease should not be accepted as strictly normal. The incidence is highest amongst the Indian Christians, as this group of 'hospital class' of this community in Calcutta seek early antenatal care and hospital admission.

GRAPH IV



Graph IV represents parity incidence.

Age.—(Graph III). The highest frequency of anæmia of pregnancy is between the ages of 15 and 20 years with a steady decline after 25 years. There is a slight deviation in Group III where the highest incidence is between the ages of 20 and 25. This is due to the inclusion of a relatively greater number of communities

other than Hindus and Mohammedans, who marry at a later age.

Parity.—(Graph IV). Primiparous women are most affected; then follows a gradual decline more or less to 7th gravida and then a sudden rise at 8th and 9th gravida.

Hygienic survey and dietetic studies

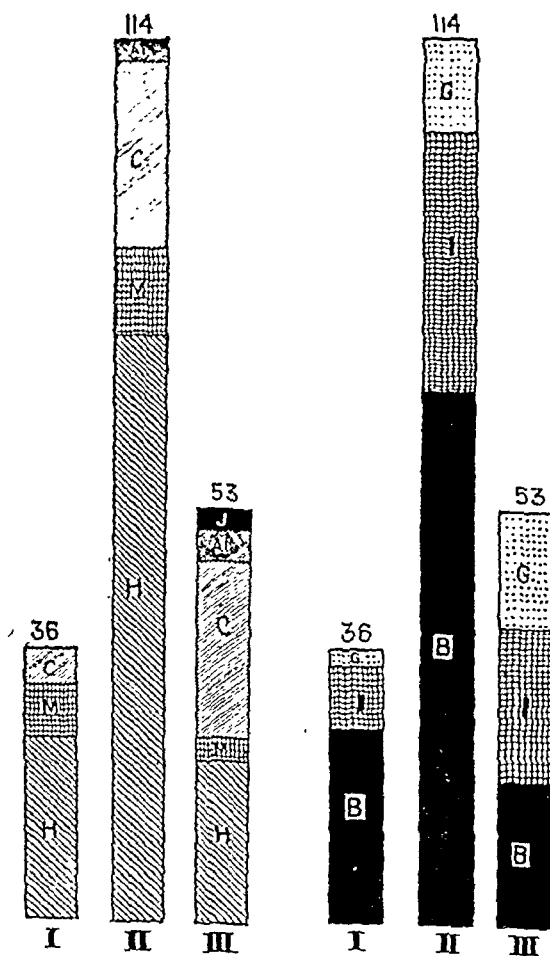
It is important to enquire into the home conditions and diets of these patients. In doing so one has to depend on the statements of the patients and their relations.

Graph V represents the hygienic survey into good, indifferent, and bad conditions and their

GRAPHS II AND V

Graph II represents community incidence.

Graph V represents hygienic survey into good, indifferent and bad.



Graphs II and V are placed side by side to show the relationship between the hygienic condition and the degree of anæmia in pregnancy. Those with better hygienic conditions suffer from a lesser grade of anæmia.

correlation in the three grades of anæmia (Groups I, II and III). It seems reasonable to think that there is some relation between the hygienic condition and the degree of anæmia in pregnancy. Those with better hygienic conditions suffer from a lesser grade of anæmia. There is no direct relationship, but the mode

of living and the dietary certainly influence the disease. This is a presumption and invites investigation into the dietary and hygienic condition of these patients.

Studies in pernicious anæmia of pregnancy in Bombay by Wills and Mehta (1930) suggest that defective nutrition is a contributory cause of 'pregnancy anæmia'.

Liver and spleen.—10.63 per cent. of cases showed an enlarged liver and 8.8 per cent. of cases showed splenic enlargement.

Pyorrhœa.—11.8 per cent. of cases.

Aplastic anæmia and pregnancy anæmia.

In aplastic anæmia, the colour-index is near unity. The progressive leucopænia and the absence of regenerative activities, even for a short period, are prominent features. The granulocytes are diminished, and there is no morphological change in the red corpuscles and no evidence of immaturity.

In pregnancy anæmia on the other hand, the colour-index is above unity. There is an average leucocytosis with an average increase of neutrophiles.

Nucleated red cells, anisocytosis, poikilocytosis, and polychromasia are clear indications of active regeneration in the marrow. The conclusion therefore, on the evidence of what we have found in Bengal, is that the blood picture of pregnancy anæmia is not aplastic in type. We differ from Balfour's conclusion with regard to 'aplastic anæmia of pregnancy' in Bombay. It may be said, however, that anomalous findings are seen in a few cases, at some stage of the disease, where the blood picture is indicative of the aplastic changes which hyperplastic marrow of the perverted type may produce.

Pernicious anæmia (idiopathic) and pregnancy anæmia and the action of liver diet on them.—A disease practically identical with pernicious anæmia occurs in the puerperium or in pregnancy (Rowland). The blood picture of pernicious anæmia resembles very much that of pregnancy anæmia, but these two differ in some essential characteristics.

In pernicious anæmia, the disease is one of late adult life and affects both sexes. Leucopænia with relative lymphocytosis is never absent. 'Achyilia gastrica' is an essential feature, linear hæmorrhages in the retina occur in almost every case in the later stages of the disease. There are characteristic periods of relapses and remissions. Patients may suffer from a spinal cord lesion.

Recently, another distinctive feature has emerged in the specific action of liver treatment on pernicious anæmia. In pregnancy anæmia none of the above syndromes are manifested. The anæmia does not invariably reappear in subsequent pregnancies. The course of the disease is different, the patient may die at any stage of the carrying period at or near

full term, or gradually recover after delivery. Liver treatment has no specific action on the malady and there is no cure of this condition by liver treatment.

The effective treatment by liver diet in pernicious anæmia is shown by the rapid increase of the red cell count to 4 or 5 millions per c.mm. within a couple of months and cessation of other symptoms, but in pregnancy anæmia patients take liver diet for months together without appreciable increase in the red cell count or cessation of symptoms. The liver has nothing more than a nutritive value in the condition. Liver stimulates the activity of regenerative marrow in any anæmia. It has a limited action on anæmia during pregnancy as is evidenced by the blood counts before and after liver treatment.

It is interesting to observe that liver treatment acts better after the termination of pregnancy. It is possibly the termination of pregnancy that counts more towards the improvement of the patient than the liver diet, or the termination of pregnancy creates an opportunity for the liver to act properly on the production and maturation of erythroblasts in the bone-marrow.

The recent work of Minot and Murphy on extracts of mammalian liver (non-protein and iron free) suggests that the disordered hæmopoiesis is of the nature of a 'deficiency disease', and the liver has a specific action on the production and maturation of erythroblasts in the bone-marrow.

Though there are wide differences between the course, symptomatology, treatment and termination of pernicious anæmia and pregnancy anæmia, the blood picture of both diseases is similar in many respects and suggests some factors common to both.

Secondary anæmia and anæmia of pregnancy

The term secondary anæmia has been applied to the anæmia associated with various definite diseases. It differs from pregnancy anæmia in the blood picture with high colour-index. The condition and the course of the disease mark it as a separate disease entity. It is independent of the Combe-Addisonian type (idiopathic). It is obviously a syndrome-complex associated with pregnancy and presents other features than the blood picture. It is not a primary anæmia, i.e., not the result of a definite defect of the bone-marrow.

We do not hesitate to state that a fair number of cases improve after the termination of pregnancy. The injury to the system and particularly to the blood forming organs is by no means negligible, and they take six months or over a year to get back to the normal blood state. In some cases, a speedy recovery is seen and the marrow resumes its normal function.

The symptom-complex of pregnancy anæmia disappears with the termination of pregnancy,

and the patient returns gradually to a more or less normal blood condition. This fact suggests the secondary nature of the 'syndrome-complex' known as 'anæmia of pregnancy'.

Anæmia due to tropical diseases associated with pregnancy

The anæmia due to ancylostomiasis is not very common in Bengal. Two cases only in this series showed ova of ancylostoma.

The anæmia due to malaria and kala-azar is certainly marked in a number of chronic cases. A few cases of chronic malaria may show a blood picture of pernicious anæmia type with high colour-index. The clinical features, the presence of parasites and laboratory methods can easily clear the diagnosis. Two cases suffering from malaria are included in this series.

In sprue, the diagnosis is loosely made because of its symptom-complex. The typical signs and symptoms of sprue are not often seen among the indigenous inhabitants of Bengal. This condition is more common amongst Europeans who are practically free from anæmia in pregnancy.

In the tertiary stage of syphilis the blood picture may resemble that of the pernicious type of anæmia (Cummer). A positive Wassermann reaction and general improvement following antisyphilitic treatment will clear the diagnosis. Only 8.5 per cent. of this series gave a positive reaction.

McSwiney (1927) in his paper on the anæmia of pregnancy reported that 40 per cent. of his cases gave a positive Wassermann reaction and suggested concealed syphilis as a probable cause of 'anæmia of pregnancy'. A doubtful reaction (30 per cent.) cannot be accepted as positive. A moderate reaction (60 per cent.) and definitely positive cases must be taken into consideration. Some authors are of opinion that the Wassermann reaction gives an anomalous result in pregnancy (Kolmer). In a series of 100 cases of pregnant women admitted to the Bengali lying-in-ward, Lieut.-Col. Gow found that only 10 per cent. of these gave a positive reaction. It is difficult to accept syphilis as a cause of pregnancy anæmia when the majority of pregnant women escape from this condition. On the other hand, the possibility of the independent development of pregnancy anæmia in a syphilitic patient must be accepted. Though most of the patients do not suffer from secondary infections when admitted in the hospital, most of them gave a history of illnesses from such diseases as malaria, kala-azar, tuberculosis and chronic dysentery.

Morbid anatomy and histopathology of the anæmia of pregnancy

As the specific features in all our cases were much the same, they are described together. Any appearances observed in any particular

one of them are noted separately. Descriptions of organs not showing any characteristic changes are omitted.

From a pathological view-point the most striking feature is the deposit of free iron in the internal organs of the body. If a thin slice of liver, spleen or kidneys be immersed in solutions of ferrocyanide of potassium and weak hydrochloric acid, it becomes gray-blue in colour. This is indicative of the presence of free iron. Marked fatty degeneration is present in the various organs. Myeloid metaplasia and areas of hæmatopoietic cells are also present in the liver and spleen.

The body is flabby rather than wasted. The nutrition of the body is maintained as compared with its extreme pallor. The internal organs appear pale.

Liver.—Slightly enlarged, appears fatty and brownish-red in appearance.

Histologically, the most striking feature is the hæmosiderin granules which are scattered like ferric dust in the liver cells themselves. They occupy the fine bile capillaries in the centre of each column of liver cells. They are specially marked around the portal tracts. It is rare for any secondary anæmia to show such an extensive pigmentation. Accumulations of erythroblastic cells and foci of myeloid hyperplasia are also met with in the capillaries as well as in the liver substance itself. In some areas the red cells are phagocytosed by the Kupffer's cells and their debris is seen within their protoplasm. Interlobular hæmorrhages and central fatty degeneration are marked. In others, diffuse fatty changes are seen in the central as well as in the portal areas.

Spleen.—It is enlarged. The cut surfaces show a dirty red appearance. The Malpighian bodies do not show any change. The presence of hæmosiderin pigment is evidenced by the Prussian blue reaction.

Histologically, myeloid metaplasia and hæmatopoietic changes are conspicuous features in our post-mortem cases. The cells of the reticulo-endothelial system are proliferated. The reticulum of the pulp is full of red corpuscles. Small groups of myelocytes and nucleated red cells are seen both inside and outside the venules. Debris of red cells is seen within the protoplasm of the large phagocytic cells, which are increased in number.

Kidneys.—They look swollen and pale. On section, the cut surfaces bulge out. The cortex looks blurred. Microscopically, the cells of the tubules have become enlarged and granular, and in some areas they contain droplets of hyaline material. Tubal epithelial cells have been shed in some areas and appear granular; epithelial casts are thus formed in some areas. A large amount of hæmosiderin pigment is seen as fine granules in the cells of the excreting tubules, but the glomeruli are more or less free from these granules.

Suprarenals.—The cortical cells appear to be vacuolated, the medulla is narrowed. Hæmosiderin pigment is seen within the capsule and just underneath it.

Thyroid gland.—A fair amount of hæmosiderin pigment is seen in the connective tissue, in the glandular structure, and also in the colloid secretion.

Bone-marrow.—General activity of all varieties of cells is a predominating feature. Non-granular mononuclear cells and granular leucocytes (myelocytes) are greatly in excess. Diffuse and scattered pigment granules are seen. The number of fat cells is greatly reduced and their place is taken by foci of different types of cellular mass. Phagocytosis of red cells is also observed. The picture is so far from being aplastic that it is rather hyperplastic in type.

These changes are illustrated in plates I and II—photomicrographs, and in the colour plate.

The following are details of illustrative cases, studied at post-mortem:—

Illustrative cases

Case 1. (Group I).—Mrs. T., aged 20, II gravida, admitted for breathlessness, œdema of the hands and feet, fever, and anæmia. All these symptoms appeared in the third trimester. Previous history of malaria, spleen enlarged. Hygienic surroundings—poor.

Laboratory findings:—

Blood count after admission.—

Red cells ..	700,000 per c.mm.
Leucocytes ..	6,500 " "
Hæmoglobin ..	15 per cent.
Colour-index—1.09	

Differential leucocyte count.—

Neutrophiles ..	61 per cent.
Lymphocytes ..	30 " "
Monocytes ..	8 " "
Eosinophiles ..	1 " "

Blood films—anisocytosis, poikilocytosis and a fair number of normoblasts. Parasites—nil.

Tests for kala-azar—negative.

Urine—albumin, a trace. Culture—sterile.

Stool—no intestinal parasites or ova present.

Puerperium—patient was running a slight temperature and died suddenly on the 5th day of the puerperium.

Necropsy: 29th September, 1928.

Morbid anatomy.—There was general anasarca with bilateral hydrothorax and hydroperitoneum.

Skin—maintained the usual fat which appeared yellow.

Pleural cavities:—Each contained 2 ounces of thin clear fluid.

Lungs—œdematous.

Heart—no gross changes.

Liver—enlarged, firm in consistency, cut surface bulged out, fatty in appearance.

Spleen (2 lbs.) enlarged. Capsule thickened and wrinkled.

Bone-marrow (middle third of femur)—red.

Histopathology—same as that described already.

Case 2.—Mrs. S., Hindu female, aged 25, II gravida, admitted on 30th November, 1927, in 7th month of pregnancy with anæmia, general anasarca, and diarrhœa. These symptoms appeared in the second trimester. She had previous history of malaria. Hygienic condition—indifferent.

She was delivered of a still-born and under weight baby 3 days after admission and died on 6th December, 1927.

Blood count after admission.—

Red cells ..	1,200,000 per c.mm.
Leucocytes ..	7,825 " "
Hæmoglobin ..	26 per cent.
Colour-index—1.08.	

Differential leucocyte count.—

Neutrophiles ..	74 per cent.
Lymphocytes ..	20 " "
Monocytes ..	5 " "
Eosinophiles ..	1 " "

Blood films—anisocytosis and poikilocytosis. A few myelocytes and a few normoblasts are present. No malarial parasites.

Tests for kala-azar—negative.

Necropsy: 7th December, 1927.

Morbid anatomy—

Skin retained subcutaneous fat.

Heart—no gross abnormality.

Pleural cavities—about 2 ounces of serous fluid present in both.

Lungs—œdematous.

Thyroid—enlarged.

Liver—slightly enlarged, fatty in appearance.

Spleen (9 ozs.)—fibrous in appearance.

Small intestine—pale, two roundworms recovered.

Gall-bladder—a gallstone of the size of a marble was recovered from it. Bile flow free.

Culture of the stone—sterile.

Smears from the splenic pulp and the liver tissue did not show any parasites.

Histological appearance is almost the same as already described.

The liver, however, shows areas of focal necrosis about the central vein showing degeneration and fatty changes. Hæmosiderosis present.

Spleen—connective tissue stroma greatly increased.

Case 3.—S. B., an Indian Christian female, 19 years of age, was admitted to the Eden Hospital on the 13th January, 1930, for anæmia, general anasarca, an unhealthy and sloughing cervix, and slight temperature. Spleen—not palpable. Urine—scanty.

Obstetric history.—She was a primipara, position of the fœtus L. O. A. Fœtal heart sounds—good. Patient had a normal delivery on 14th January, 1930, child weighed 5 pounds 13 ounces. She had only one suture for a superficial tear.

Temperature and pulse—normal for the first three days.

Patient had iron and arsenic treatment, 1 c.cm. injections every alternate day. Also liver diet. Temperature shot up to 105°F. on the 4th day after delivery. Very little pent up lochia—not very offensive. Patient died on the 24th January, 1930.

Laboratory data on admission. Urine—albumin, a trace. Sediment:—a few red corpuscles, epithelial cells, pus cells, calcium oxalate crystals and micro-organisms. Culture:—Yielded *B. coli communior* (hæmolytic).

Blood count.—

Red cells ..	1,300,000 per c.mm.
Leucocytes ..	9,000 " "
Hæmoglobin ..	30 per cent.

Differential leucocyte count.—

Polymorphonuclears ..	78 per cent.
Lymphocytes ..	21 " "
Monocytes ..	Nil.
Eosinophiles ..	1 " "

Blood picture.—Anisocytosis and poikilocytosis.

Aldehyde and Chopra's tests—negative.

Blood culture—sterile for 48 hours.

Necropsy: 25th January, 1930.

Skin—lemon colour, subcutaneous fat normal.

There was general anasarca with bilateral hydrothorax, and hydroperitoneum. Spleen—firm, trabeculæ increased. The organ was congested.

PLATE I

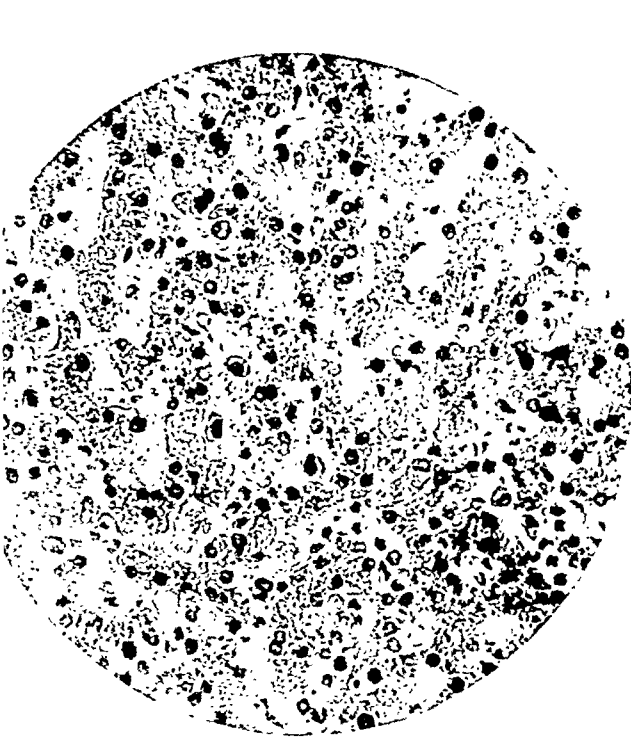


Fig. 1.—Section of liver, post-mortem Case No. 2, showing diffuse fatty changes, sinusoids are full of red blood corpuscles. Foci of myeloid hyperplasia are seen. Hemosiderin granules are scattered like ferric dust in the liver cells.

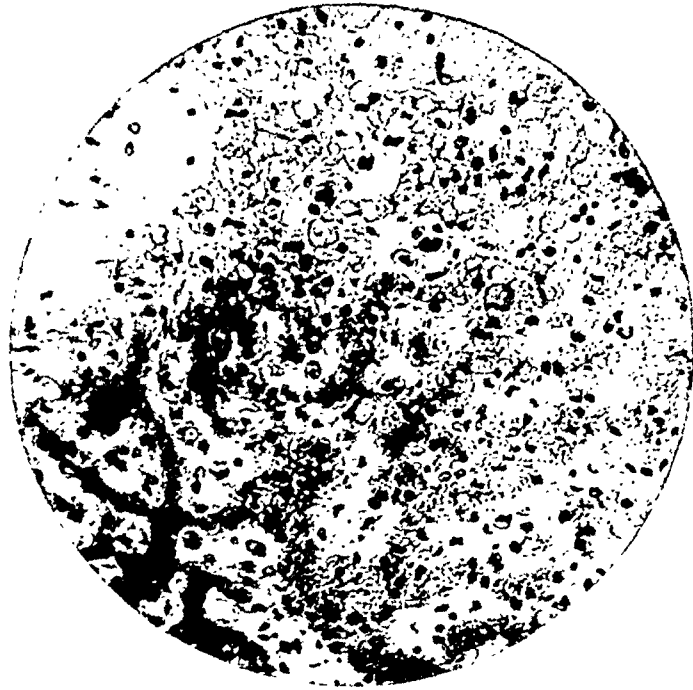


Fig. 2.—Section of liver, post-mortem Case No. 4, showing focal necrosis with cell infiltration. Fatty changes are marked particularly round the central zone. It has taken the appearance of passive congestion. Hemosiderin granules are seen. Myeloid changes are less marked.

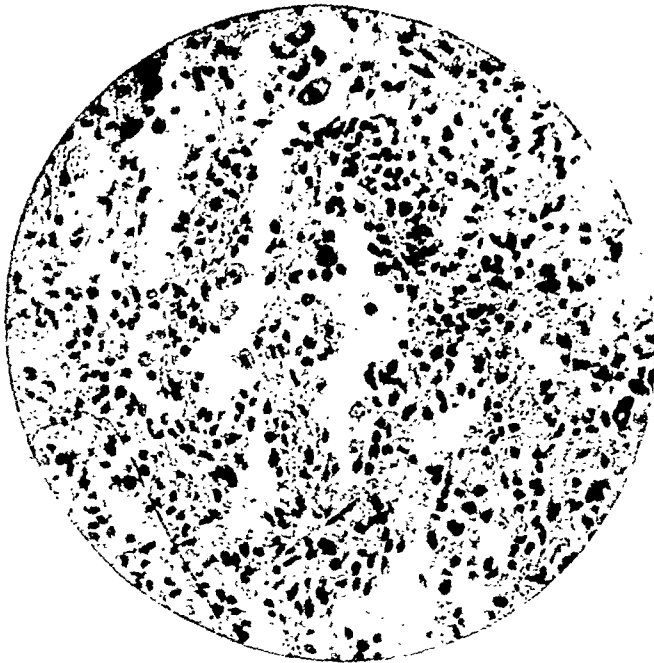


Fig. 3.—Section of spleen, post-mortem Case No. 1, showing reticulum of pulp full of red corpuscles. Small groups of myelocytes and nucleated red cells are seen both inside and outside the venules. Large phagocytic cells are also seen.

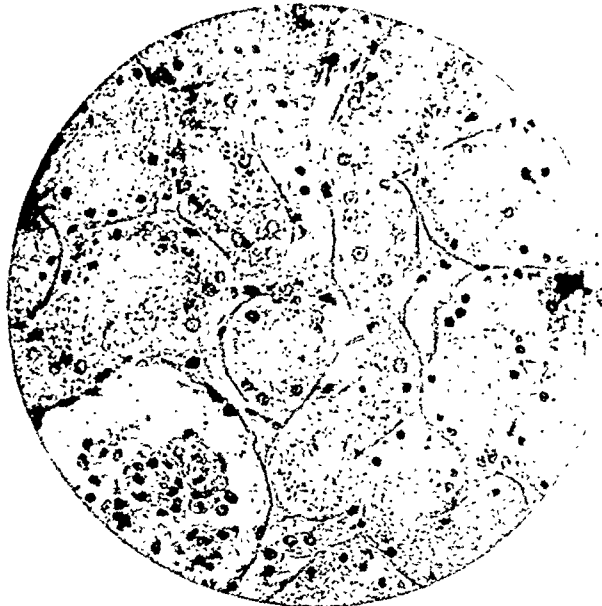


Fig. 4.—Section of kidney, post-mortem Case No. 2, showing the granular appearance of the epithelium lining the tubules. Hemosiderin granules are seen in the cells of the excreting tubules, glomeruli are more or less free.

PLATE II

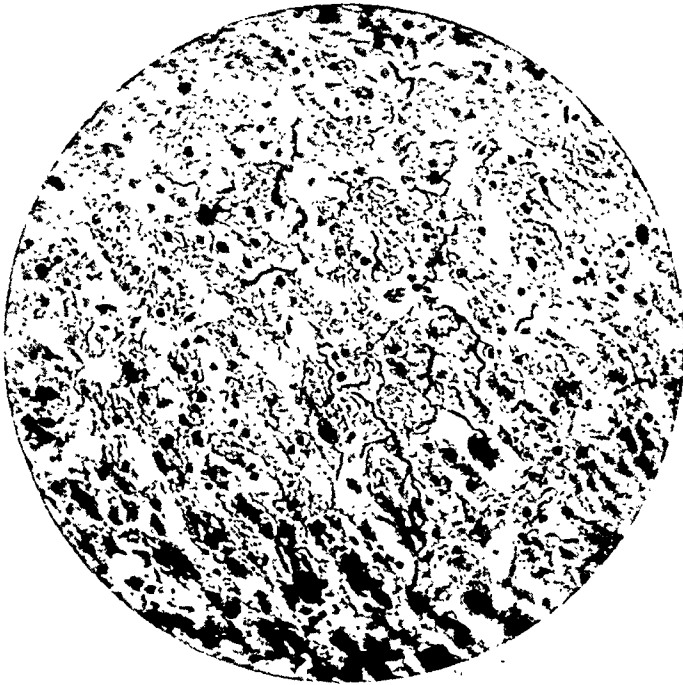


Fig. 5.—Section of liver, post-mortem Case No. 2, showing increase of fibrous tissue and reticulum.

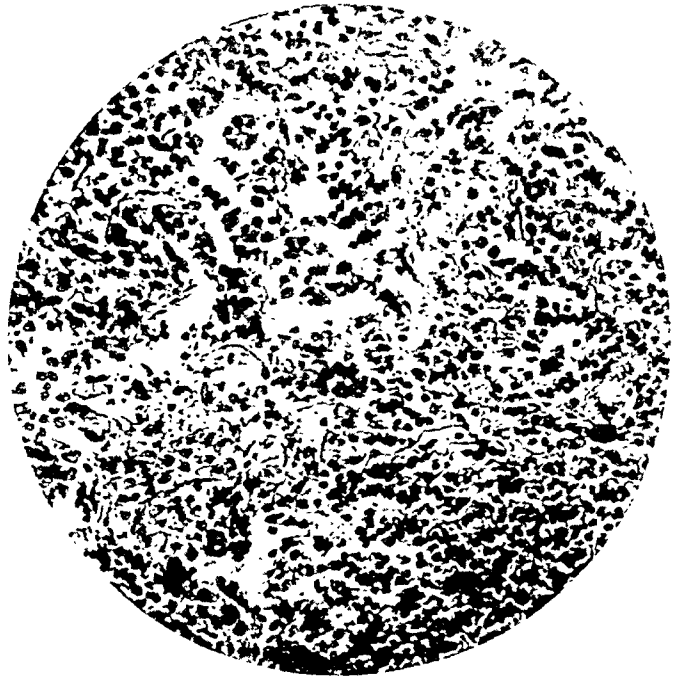


Fig. 6.—Section of spleen, post-mortem Case No. 1, showing increase of fibrous tissue and reticulum.

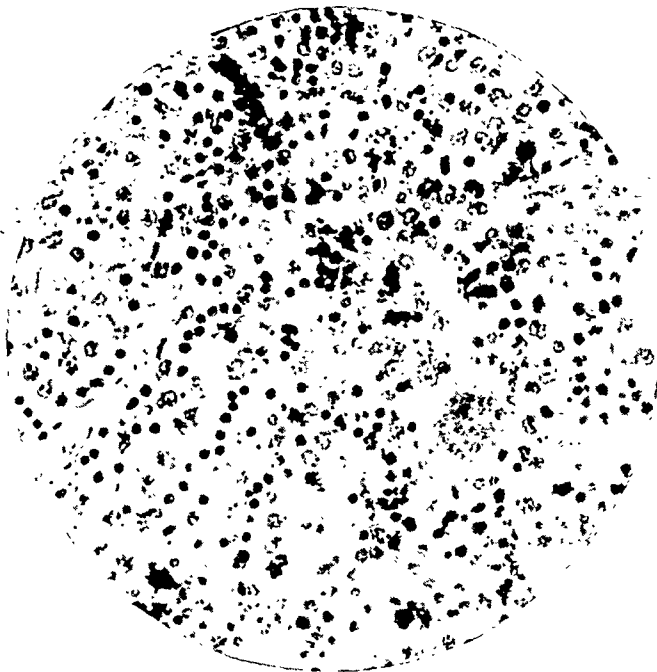


Fig. 7.—Section of bone-marrow, post-mortem Case No. 2, showing general activity of all varieties of cells. Diffuse and scattered pigment granules are seen.



Fig. 1.—Section of liver showing hæmosiderosis, the pigment being scattered like ferric dust within the tissue.

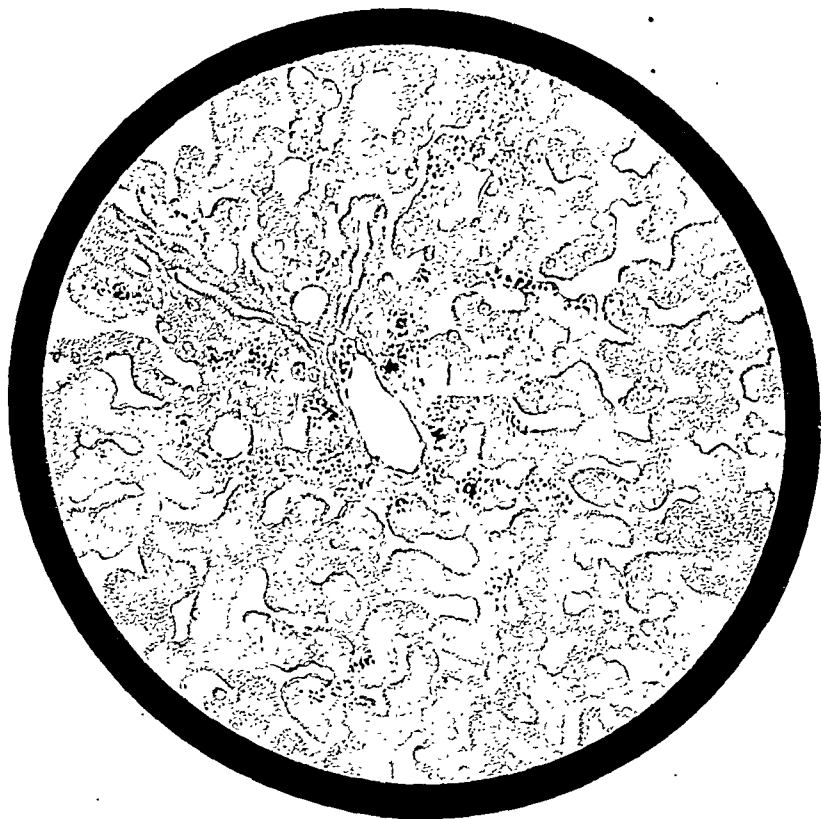


Fig. 2.—Section of kidney showing hæmosiderosis in the tubules.

Liver—enlarged, consistency—firm; pale in appearance, cut surface looks yellowish and fatty. Kidney—capsule is thickened; strips off easily, appears pale and fatty. Cortex and medulla indistinguishable.

Uterus—enlarged; site of placenta—ragged and filled with blood clots. There was a fibrinous exudate rich in leucocytes over the necrotic tissue, forming a sort of false membrane.

Culture from the scrapings yielded streptococci (non-hæmolytic) and *B. coli* (hæmolytic).

Morbid histology. Uterus—there was formation of infected thrombi in the veins. The muscle tissue was densely infiltrated with leucocytes and red corpuscles.

The infection was carried to the other organs of the body by discharge of infected emboli in the veins.

Spleen, liver, and kidney showed evidence of septic necrosis and infiltration with leucocytes. There was hæmosiderosis in all the organs. The spleen and liver showed myeloid changes.

Case 4.—J. D., Hindu female, aged 20, admitted on 17th December, 1931, for general anasarca, anæmia, and breathlessness. These symptoms appeared in the second trimester. Hygienic surroundings—poor.

Spleen—slightly enlarged; previous history of malaria. Temperature on admission 99°F. Blood pressure 120/70.

Obstetric history.—3rd para; 7 months pregnancy; had similar condition of anæmia during last pregnancy 2 years before. Patient gave birth to 2 still-born premature babies on the 3rd night of admission. She gradually became worse and died on the 6th day of admission.

Laboratory data on admission.

Urine, albumin—a trace, no casts. Culture—sterile.

Blood count—

Red cells 900,000 per c.mm.

Leucocytes 6,000 " "

Hæmoglobin 20 per cent.

Differential leucocyte count—

Neutrophils 60 per cent.

Lymphocytes 28 " "

Monocytes 12 " "

Eosinophiles Nil.

Blood picture—a few megaloblasts are present.

Anisocytosis and poikilocytosis.

Wassermann reaction—negative.

Stool—semi-solid, no blood or mucus.

Culture—yielded colon bacteria.

Necropsy: 23rd December, 1931.

Morbid anatomy.—There was general anasarca with bilateral hydrothorax and hydroperitoneum. The external genitalia were greatly swollen and oedematous.

Skin—lemon coloured, subcutaneous fat retained and gave a typical bright yellow appearance of pernicious anæmia.

Pleural cavities—each contained 700 c.cm. of thin pale clear fluid.

Lungs—marked gross abnormality.

Heart—dilated; no gross abnormality.

Spleen—enlarged, firm in consistency, chocolate coloured in appearance.

Liver—enlarged, pale and appears fatty, cut surface looks passively congested.

Kidney—pale and oedematous, capsule strips off easily.

Ileum—a few actively moving roundworms were present.

Uterus—subinvolved; uterine muscle oedematous.

Marrow—almost red in appearance, showing hyperplastic changes.

Culture from heart blood—sterile.

Morbid histology.—The histological appearance is the same as has already been described. Section of the liver, however, shows areas of focal necrosis with cell infiltration. Diffuse fatty changes are present. Fatty changes are marked particularly round the central zone. Sinusoids are full of red corpuscles.

The section shows the appearance of a passive congestion with marked fatty changes of the central zone with hyperæmia. Myeloid changes are less marked.

Hæmosiderosis is present in all the organs.

Dr. S. Mitter in his cases showed similar histological appearances in sections of the liver, and from this manifestation he concludes the disease to be of toxic origin. This seems to be rather unwarranted.

Mallory regards the necrosis of the cells as due to toxic influences usually of infectious origin and minimises the effect of changes in blood pressure. The more extreme the stasis, the more certain is the central necrosis and hæmorrhage. Others think the necrosis to depend upon stasis alone, which damages the liver tissues by asphyxiation.

Discussion

The syndrome-complex of pregnancy anæmia is rarely seen in any other condition except pregnancy in the general population of Bengal. This idea is contrary to the observation of Wills and Mehta in Bombay (1930).

It seems that the symptom-complex of pregnancy anæmia is only a manifestation of pathological changes occasioned by a variety of extrinsic factors.

The view that causation is by a bacterial toxin (probably of a hæmolytic nature) from the alimentary tract has been widely accepted since Hunter's treatise appeared. He believed that pernicious anæmia was a specific malady. Hurst admits the infective theory but advocates no single ætiological agent. Knott in 1917 found the occurrence of septic strains of hæmolytic bacteria. He found 48 per cent. of hæmolytic *B. coli* and 4 per cent. of hæmolytic streptococci in the faecal flora. Our findings in the faecal flora are however different. Kahn and Torrey have found an unusually large number of *Bacillus welchii* (*aerogenes capsulatus*) in the stools of patients with pernicious anæmia, and have demonstrated a soluble product which produces a similar disease in monkeys.

Many of our cases suggest a low grade of sepsis or infective condition as evidenced by a rise of temperature and leucocytosis, with a relative increase of neutrophils.

My personal view is that no specific causal organisms exist to bring about this condition, but the quantitative increase of bacteria of the faecal flora and their upward extension to unusual sites set up a low grade of infection and result in entero-colitis, which is frequently noticed in pregnancy anæmia. This is one of the factors which is responsible for the syndrome of pregnancy anæmia.

Recent investigations on biochemical lines suggest that some unknown hæmolysin and the lecithin of the red corpuscles, in the absence of a normal amount of cholesterol, cause hæmolysis. Red corpuscles and nervous tissue contain more lecithin than any other tissue of the body. In pregnancy anæmia, however, the nervous tissue is not affected. That anæmia of pregnancy is due to toxæmia is the theory advanced by James Young and other continental workers.

Heymann found a lipoid substance from alcoholic extracts of autolysed placenta which produced hæmolysis *in vitro*. The hæmolysin

thus elaborated is found in both the placenta and the blood, and is supposed to break down maternal blood cells. Hofbauer found a syncytial hæmolyisin in the ectodermal cells of the chorion to be the cause of maternal blood destruction in early pregnancy. He concluded that the physiological anæmia was overcome in the second half of pregnancy by an anti-hæmolyisin formed in the maternal blood. There is a tendency to give the subject of toxæmia the greater attention. Some of the cases may be of toxic origin as the majority of cases did not have any prenatal care and practically all the patients were seen for the first time in the last few weeks of pregnancy.

The theory of toxæmia is, however, difficult to maintain. It cannot explain the erythropoietic as well as the leucocytopoietic activities of the bone-marrow and also the tendency to low blood pressure encountered in these cases. In this particular paper we are not concerned in the investigation of the physiological anæmia of pregnancy. We have no hesitation in thinking that some factors remain undisclosed, which are responsible for the fundamental nature of the pathological anæmia which is seen not only in this country but in other parts of the world.

Most of our cases are hydræmic in type and show increase in the water content of the plasma. Little work however has been done by us on this line. Hæmosiderosis is demonstrated in the different tissues where external blood destruction takes place. The blood destruction is caused by increased activity of the cells of the reticulo-endothelial system as manifested by erythrophagocytosis in hepatic as well as in splenic sections.

Peabody and Broun draw attention to the activity of phagocytosis of erythrocytes by cells of the reticulo-endothelial system, especially in the bone-marrow.

The hæmolysis might be due to the production of abnormal red corpuscles from a perverted erythropoietic depot, and the factors which influence and result in such a condition are enumerated below.

(a) The analysis of the red cell count of our series of otherwise healthy women is about 3,000,000 per c.mm. This is certainly not normal, and is possibly due to the deficient intake of the proper type of material that goes towards forming blood. The average diet of the Bengali is greatly deficient in proteins and fats.

(b) During the first trimester in pregnancy there is insufficient intake of the proper type of food due to gastric disturbance causing nausea and vomiting, particularly marked in primiparæ.

Under normal conditions these symptoms gradually disappear and the appetite improves. In pregnancy anæmia, the appetite does not return and the patient suffers from entero-

colitis, which further interferes with nutrition. She gradually becomes anæmic. Added to this, the daily routine of the house is a great strain on her system and the environmental conditions are not refreshing in the majority of cases. Most of them neglect antenatal care and develop a typical picture of pregnancy anæmia at the end of the third trimester, when they seek admission to the hospital only for delivery.

(c) Most of the patients suffer from some form of anæmia-producing tropical diseases at some period in their lives. This factor is very important. The effects of these diseases on the blood-forming organs are by no means negligible. The damage to the hæmatopoietic system is hardly tackled in most cases because the treatment is given up as soon as the patient finds a slight amelioration of her symptoms.

The above factors disturb the balance of the blood-forming organs and create a field of perverted erythropoiesis in pregnancy, so that abnormal red corpuscles might be easily and unduly destroyed in the spleen or liver.

The syndrome-complex is thus a manifestation of a pathological entity. The variability of the symptoms is due to various factors, one or other or a group of those mentioned above may bring about this pathological entity.

Treatment

From the foregoing discussion I consider the syndrome-complex of pregnancy anæmia can be averted by prophylaxis and early antenatal care; a general improvement in health by proper dieting; and improvement in the general social and economic conditions by a better mode of living.

The value of birth control should be demonstrated to those who suffer from anæmia.

In these cases abstinence should be preferred to contraceptive means. The husband should be made conscious of the serious consequence of conception with pre-existing anæmia. All efforts should be concentrated on the first half of pregnancy when proper antenatal care is all important. It is the total nutrition that matters much in our cases in Bengal. It is a wrong idea to think that rich people do not suffer from pregnancy anæmia.

Some general remarks on the treatment of cases of pregnancy anæmia by the Obstetric Physician of the Eden Hospital may here be quoted :—

During the first trimester, the husband should be advised to humour his wife in her choice of diet, but at the same time should give her judiciously a diet with plenty of vitamins, and maintain a proper nutrition.

Any foci of sepsis should be removed. If in spite of all treatment severe anæmia supervenes in the first three months of pregnancy, particularly if there is a previous history of pregnancy anæmia, interruption of the pregnancy should be definitely advised.

We rarely meet with a case of severe anæmia at this stage of pregnancy in the hospital, but in private I have seen these cases successfully treated by emptying the uterus.

The question of specific treatment does not arise as most of them do not suffer from a specific disease. Antiluetic treatment would naturally be accorded to cases showing a positive Wassermann reaction.

At the beginning of the second trimester, particular care should be taken to improve digestion and aid proper assimilation of food.

A balanced diet should be recommended in an easily digestible form. Milk preparations in all forms made palatable and easily digestible should be allowed.

Fresh fruits, honey, gur, vegetables and liver extracts or any preparation of liver which happens to please the patient, are the routine treatment of the Eden Hospital. Thyroid and calcium may help.

My own idea is that liver or vitamine treatment, alkalies and bitters, will have a better result in the first half of pregnancy. They can have very little action in the third trimester, owing to the inhibitory effect of sepsis on liver treatment. Pre-existing anæmia should be primarily treated.

We welcome the recent publication on the treatment of 'pernicious anæmia' of pregnancy with Marmite by Lucy Wills. It was used to prevent disease amongst the troops in Mesopotamia, and Lieut.-Col. Leicester used to prescribe it for debilitated patients in the Eden Hospital, but its effect on these patients was not studied scientifically.

Intramuscular injections of whole blood (20 c.cm.) repeated every other day, or repeated small transfusions for a month, may improve the blood in the first half of pregnancy. (1925 to 1926 on ten cases only).

Repeated small transfusions are advantageous, particularly in the *moffussil* where they can be given without blood grouping. Col. Green-Armytage tried this method and none of his cases showed any untoward effect.

Intravenous blood transfusion in most of our cases in the Eden Hospital set up strong uterine contractions ending in premature labour.

Artificial interruption in the third trimester is invariably attended with some degree of sepsis. If the patient is left alone, pregnancy usually terminates spontaneously by premature labour.

Liver treatment and blood transfusion undoubtedly give better results *after* the termination of pregnancy.

Summary

(i) Pregnancy anæmia is not a disease entity but a syndrome-complex.

(ii) The symptom-complex of pregnancy anæmia is a manifestation of pathological changes in the different tissues as evidenced by

hæmosiderosis, erythrophagocytosis and increase of cells of the reticulo-endothelial system and foci of myeloid changes in spleen and liver.

(iii) Defective hæmatopoiesis is due to the factors of (a) inadequate nutrition, (b) social and environmental conditions, (c) lack of ante-natal care, (d) pre-existing anæmia and a possible defect in the blood-forming organs following anæmia, caused by tropical diseases. One or other, or a group of them in a condition like pregnancy upset the balance of the hæmapoietic system and abnormal corpuscles are thrown into the circulation, to be destroyed by the reticulo-endothelial cells which are increased in this condition.

(iv) Primiparæ suffer most, but the severity of the anæmia is not affected by age or parity.

(v) On the other hand nutrition and the mode of living, social and economic conditions, and early antenatal care markedly influence the severity of the anæmia. It is not so much the poverty but the injudicious dieting which is important.

(vi) There is an underlying sepsis, probably from the intestine by a quantitative increase of bacterial contents and their extension to usual sites. No particular bacterium is responsible for this. General leucocytosis with relative increase of neutrophils is an evidence of sepsis.

(vii) Hæmatological and histopathological findings in pregnancy anæmia are similar to those of the 'pernicious anæmia' of Combe-Addisonian type. Leucopenia is absent in the majority of our cases of pregnancy anæmia.

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CLINICAL STUDIES IN MALARIA BY CULTURAL AND ENUMERATIVE METHODS. SECOND SERIES

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In two previous papers (Knowles and Das Gupta, 1930, 1931) we have drawn attention to the value of cultural and enumerative methods in the clinical study of malaria. Since the publication of our 1931 paper these studies

have been continued, and in the present paper we propose to give details of 23 selected further cases which are of interest, adopting consecutive serial numbering from the former paper. For purposes of classification it will probably be best to divide the cases concerned according to the species of parasite responsible. In order to save space, we shall adopt a tabular form for details wherever possible.

Infections with *Plasmodium vivax*. 6 cases

Case 16. *Low grade infection. Spontaneous cure.*—Kamala, Indian Christian, male child, aged 6 years, admitted on 18th January, 1932, with a history of fever for ten days. Spleen and liver not palpable. Temperature 98.8°F.

20th January. Afebrile. Parasite count 40 per c.mm.—rings.

21st January. Afebrile. Parasite count 80 per c.mm.—rings and trophozoites.

22nd January to 9th February. Afebrile. No parasites seen in thin and thick films.

9th February. Bass culture sterile.

Case 17. *Spontaneous cure with very rapid disappearance of gametocytes from the peripheral circulation.*—Mrs. S., Anglo-Indian, aged 22. Was treated for kala-azar four years previously and cured. History of fever with rigors for five days. Admitted 28th January, 1932. Spleen and liver not palpable. Parasite count, total 6,600 per c.mm., of which 1,800 per c.mm. are gametocytes. Temperature 98°F.

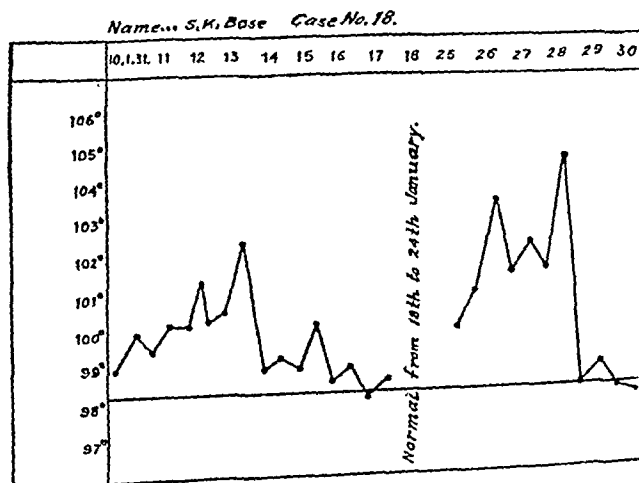
29th January. Temperature 99.2°F. Parasite count 80 gametocytes per c.mm.; no asexual forms seen.

30th January to 15th February. Afebrile. No parasites seen in thin and thick films.

15th February. Bass culture sterile.

Note.—The very rapid disappearance of gametocytes from the peripheral blood in this case is noteworthy. The duration of life of gametocytes of *P. vivax* in the peripheral blood (unless taken in by a transmitting anopheline) is probably only a matter of a few days.

CHART I



Case 18. *Experimentally induced benign tertian malaria. Spontaneous cure.*—S. K. Bose, Hindu male adult, admitted 13th December, 1930, with glossopharyngeal spasm. States that he had an attack of malaria about a month previously, but thin and thick films show no parasites. It was decided to induce malaria from a therapeutic point of view, and he was given 1/4 c.cm. of blood from a patient with benign tertian malaria on 23rd December.

Date 1931	Tempera- ture *	PARASITE COUNT PER C.M.M.		Total
		Asexual forms	Gameto- cytes	
10th January	99°F.	Scanty rings.		
11th January	100.2°F.	Scanty rings.		
13th January	101.4°F.	3,920	560	4,480
14th January	99.4°F.	4,520	640	5,160
15th January	100.2°F.	3,680	720	4,400
17th January	98°F.	0	0	0
18th to 24th January	Temperature normal; no parasites seen.			
26th January	103.4°F.	4,640	0	4,640
(relapse).				
27th January	101°F.	5,360	0	5,360
28th January	101.6°F.	4,880	0	4,880
29th January	98.4°F.	80	0	80
30th January to 2nd February.	Temperature normal; no parasites seen.			
2nd February.	Bass culture sterile.			

We are much indebted to Dr. S. P. Bhattacharji for allowing us to inoculate this patient. There are several points of interest in the case. No quinine or other anti-malarial drug was given at any time. A 'follow-up' postcard was received from the patient on the 11th January, 1932, stating that he was in excellent health and had had no further fever. In the first attack of fever there was a free production of gametocytes, in the relapse no gametocytes could be detected. There would appear to be some particular factor in the patient's constitution, which when present favours gametocyte production, and when absent inhibits it.

Case 19. *Rapid cure by Atebrin.*—Jogeswar Dindu, Hindu male, aged 20, admitted on 3rd March, 1932, with

11th March. Parasite count 3,280—growing trophozoites, early schizonts and very scanty gametocytes. Now given Atebrin, one tablet of 0.1 gramme t.d.s., for four days.

12th March. Parasite count 80 per c.mm.—rings only.
13th to 21st March. No parasites seen in thin and thick films.

21st March. Bass culture sterile.

Case 20. *Benign tertian malaria in a patient with kala-azar. Malaria cured by Atebrin.*—Subala, Hindu female child, aged 8 years, admitted on 5th March, 1932, with a history of fever of seven months' duration. Spleen enlarged to 4 finger-breadths below the costal margin, liver to 1 finger-breadth. Spleen puncture showed numerous *L. donovani*, whilst the aldehyde test was ++.

2nd April. Routine blood examination showed the presence of *P. vivax* infection, rings and growing trophozoites. It was decided to treat the malaria infection first, and the kala-azar infection subsequently.

4th April. Parasite count 1,980 per c.mm.—chiefly growing trophozoites.

5th April. Parasite count 440—rings only.

6th April. Parasite count under 40 per c.mm. Temperature 100.4°F.

7th April. Parasite count 120 per c.mm.—growing trophozoites. Temperature 101.4°F.

9th April. Parasite count 280 per c.mm.—growing trophozoites. Temperature 101°F.

Now put on Atebrin, one tablet of 0.1 gramme t.d.s., for four days.

11th April. Temperature 99°F. No parasites seen.

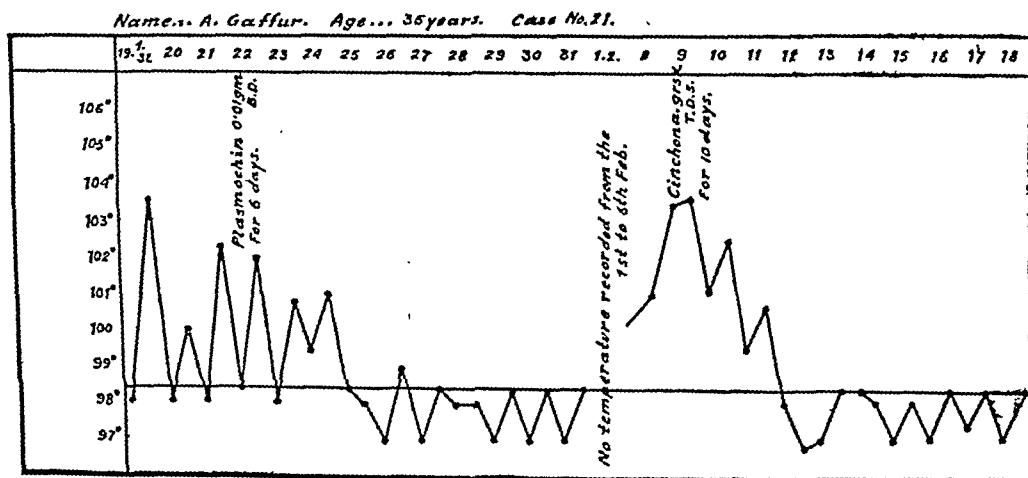
12th April. Temperature 100.4°F. No parasites seen.

13th April. Temperature 97.4°F. No parasites seen.

14th April. Temperature 97.2°F. No parasites seen.

The patient was now treated for kala-azar. At the moment of writing she is still in hospital (11th May, 1932), no parasites can be detected in thin and thick blood films, and she appears to have been cured of both infections.

CHART II



a history of fever and rigors off and on for four months. Spleen and liver not palpable; profound anæmia present. Blood films show a heavy infection with *P. vivax*—all phases present.

8th March. Parasite count 14,800 per c.mm.—all phases.

9th March. Parasite count 2,400 per c.mm.—chiefly trophozoites.

10th March. Parasite count 6,840 per c.mm.—chiefly trophozoites.

* The temperatures recorded in the text are those taken at the time the parasite count was made. The temperatures shown in the charts are from the twice-daily hospital records, and accordingly differ.

Case 21. *Relapse after Plasmochin treatment.*—Abdul Gaffur, Mohammedan male, aged 35, admitted on 19th January, 1931, with a history of intermittent fever and diarrhoea of one month's duration. *P. vivax* infection present.

20th January. Temperature 99°F. Parasite count 2,320 per c.mm., mostly growing trophozoites; no gametocytes seen.

21st January. Temperature 98.2°F. Parasite count 5,480, mostly rings, no gametocytes seen.

22nd January. Temperature 99.4°F. Parasite count 2,760 per c.mm., rings and trophozoites. Very scanty gametocytes, less than 40 per c.mm.

Now put on Plasmochin 0.01 gramme b.d. for six days.

23rd January. Temperature 99°F. Parasite count 2,560 per c.mm., mostly rings; no gametocytes seen.
 24th January. Temperature 101°F. Parasite count 1,600 per c.mm., rings only.
 26th January. Temperature 99°F. Parasite count 1,680 per c.mm., rings and trophozoites.
 27th January to 7th February. Afebrile. No parasites seen.

8th February. Rigor this evening.

9th February. Temperature 101.4°F. Parasite count 3,280 per c.mm., rings only.

Now put on to cinchona febrifuge gr. x t.d.s., with alkalis for ten days.

10th February. Temperature 102.2°F. Scanty parasites present.

11th to 20th February. Afebrile. No parasites seen in thin and thick blood films.

20th February. Bass culture sterile.

Note.—There are several points of interest about this case. Possibly the dose of Plasmochin given was too small *viz.* 0.01 gramme b.d. for six days, or a total of 0.12 gramme, but we prefer to give Plasmochin in smaller doses than those usually recommended, and run no risks. The immediate response to cinchona febrifuge plus alkalis is to be noted, as contrasted with the much slower action of small doses of Plasmochin.

Infections with *Plasmodium malariae*. 7 cases

Case 22. Persistently low counts, with no tendency to spontaneous cure.—P. Ghosh, Hindu male, aged 19; admitted to hospital on 12th February, 1931, with a history of fever off and on for 18 months. Spleen very much enlarged, liver not palpable.

PARASITE COUNT PER C.MM.

Date 1931	Temperature	Asexual forms	Gametocytes	Total
16th February	100.8°F.	480	320	800
17th February	N.	160	0	160
18th February	98.6°F.	320	80	400
19th February	102°F.	480	0	480
20th February	N.	360	80	440
21st February	N.	680	160	840
22nd February	102°F.	Counts not done (Sunday)		
23rd February	N.	920	320	1,240
24th February	104°F.	680	320	1,000
25th February	99.4°F.	200	640	840
27th February	101°F.	960	0	960
28th February	N.	680	320	1,000
2nd March	N.	640	0	640
3rd March	104.2°F.	800	320	1,120
4th March	N.	960	0	960
5th March	N.	640	0	640
6th March	101°F.	780	320	1,100
7th March	N.	640	0	640
Now put on to cinchona febrifuge gr. x t.d.s. with alkalis.				
9th March	N.	120	40	160
10th March	N.	0	160	160
11th March	N.	40	0	40

12th March. Cinchona febrifuge reduced to gr. x b.d. as patient complains of severe giddiness.

13th March to 23rd March. Afebrile. No parasites seen. Cinchona febrifuge discontinued on 17th March.

23rd March. Bass culture sterile.

Note.—The case presents several points of interest. As it was one especially suitable for study of an untreated quartan infection, treatment was withheld for nearly three weeks. The high temperatures on 24th February and

3rd March were associated with parasite counts which were lower than the count of 1,240 per c.mm. associated with a normal temperature on 23rd February; this association of high fever with a relatively low parasite count is rather characteristic of the early phases of infection with *P. malariae*. Secondly, it will be seen that gametocyte production is intermittent in character, also that the proportion of gametocytes to asexual forms is relatively high in infections with *P. malariae*—a fact which has not yet been appreciated by several authors of textbooks. Thirdly, the immediate effect of cinchona febrifuge in exterminating the infection is well seen. The urine was tested on 10th and 11th March with Meyer's reagent with positive results, showing that the alkaloids were being absorbed and excreted.

Case 23. Chronic quartan malaria with persistently low counts. No tendency to spontaneous cure. Cure by quinine-troposan.—Sayed Haru, Mohammedan male, aged 38 years, employee of the Bengal-Nagpur Railway, sent to hospital by Mr. Senior-White on 19th March, 1931, with a diagnosis of quartan malaria of long standing. Spleen enlarged.

PARASITE COUNT PER C.MM.

Date 1931	Temperature	Asexual forms	Gametocytes	Total
20th March	N.	800	160	960
21st March	99.4°F.	640	160	800
23rd March	N.	760	80	840
24th March	99.4°F.	120	0	120
25th March	99.6°F.	280	40	320
26th March	100°F.	440	40	480
27th March	99.4°F.	400	0	400
28th March	99.2°F.	320	0	320
30th March	100°F.	480	160	640
1st April	98.8°F.	160	40	200
2nd April	99.2°F.	640	160	800
3rd April	98.4°F.	560	80	640
6th April	102.4°F.	320	80	400
7th April	98.2°F.	800	0	800
8th April	99°F.	600	40	640
9th April	102.6°F.	1,000	80	1,080

Now put on to quinine-troposan, 3 tablets b.d., with alkalis for ten days.

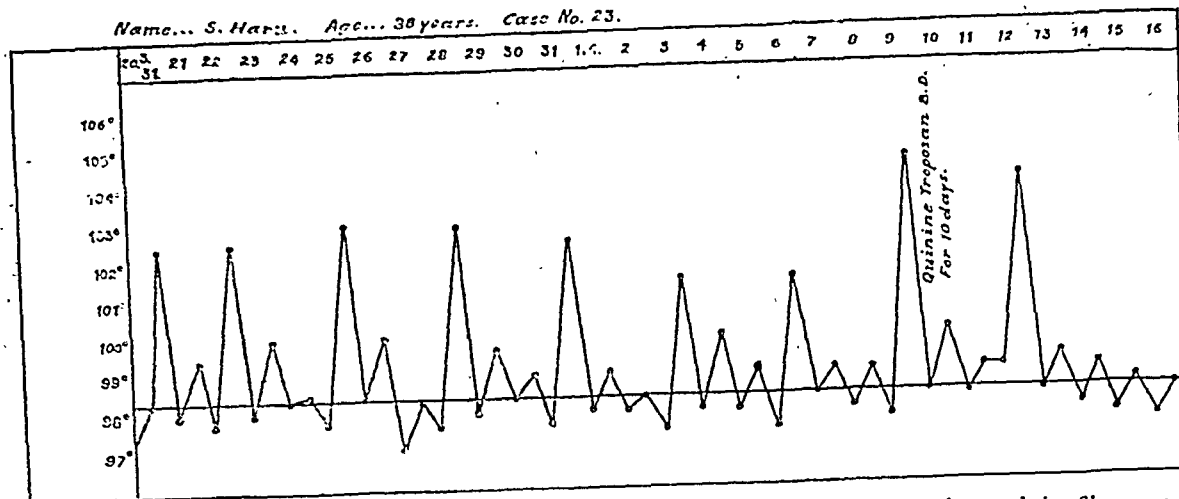
10th April	99°F.	360	40	400
11th April	98°F.	120	40	160
13th April	101°F.	40	0	40
14th April	98.4°F.	Scanty disintegrating parasites.		
15th April to 21st April. Afebrile. No parasites seen.				
21st April. Bass culture sterile.				

Note.—This case again well illustrates the conditions present in a chronic infection with *P. malariae*. Counts are persistently low, but with no tendency to spontaneous disappearance of the parasites. The proportion of gametocytes to asexual forms is considerable, but their appearance in the peripheral blood is intermittent in character. Quinine-troposan cleared the infection, but appeared to do so more slowly than would quinine or cinchona febrifuge. The spleen was not palpable when the patient left hospital.

Case 24. Chronic infection with low counts and no tendency to spontaneous cure. Cure with quinine-troposan.—Dwaitari Pandu, Hindu male, admitted on 1st June, 1931, with a history of fever every fourth day

CHART III

Name... S. HARRIS. Age... 38 years. Case No. 23.



off and on for ten months. Spleen enlarged to 3 finger-breadths below costal margin, liver not palpable.

2nd to 12th June. Afebrile. Parasite counts ranged from 40 to 640 per cmm.

12th June. Put on to quinine-troposan, 2 tablets b.d., with alkalies for ten days.

13th to 21st June. Parasites disappeared by the third day.

22nd June. Bass culture sterile.

Case 25. Experimentally induced quartan malaria in a diabetic subject.—It would appear that the malaria parasites are dependent upon the blood sugar for their growth and multiplication. As is well known, in the cultural method of Bass traces of glucose must be present if growth is to occur. On the other hand Bass and Johns (1913) have shown that if blood from a diabetic be used for the cultures, no glucose need be added. Hegner and MacDougall (1926) and MacDougall (1927) have found in connection with avian malaria, that increasing the blood sugar in infected birds by feeding them with solutions of glucose brings about conditions favourable to the accumulation of parasites in the blood, whereas decreasing the blood sugar by injections of insulin probably inhibits the accumulation of parasites. Das Gupta (1931) has described a fatal case of malaria in a diabetic subject, in whom the blood sugar was never above 0.150 per cent. Slight dietetic modifications brought it down to a normal level. At this point the patient contracted a very severe infection with *P. falciparum*. Cerebral symptoms and coma supervened and despite the administration of quinine intramuscularly the case ended fatally from heart failure. Twelve hours before death the blood sugar titre was only 0.0714 per cent. The question may be raised therefore as to whether malaria is a more severe disease in the diabetic than in the non-diabetic patient. An opportunity to test this experimentally occurred in February 1931, and *P. malariae* was selected as the infecting virus, as this was likely to cause less disturbance to the patient's health than either of the other two species. Details are as follows:—

Arsed Ali, Mohammedan male, aged 32 years, a diabetic subject was admitted to hospital on the 17th February, 1931. The blood sugar on admission was 0.300 per cent.

17th February. Given hypodermically 1.75 c.cm. of blood from a patient with quartan malaria, showing a parasite count of only 160 parasites per cmm.

This inoculation failed to take, as the recipient showed neither fever nor parasites up to the 7th March.

7th March. Given 2.5 c.cm. of blood hypodermically from the same quartan donor as before, the donor's blood containing 640 parasites per cmm.—mostly growing trophozoites.

31st March. Developed fever.

2nd April. Parasites first detected in films, scanty mature schizonts.

PARASITE COUNT PER C.M.M.

Date 1931	Temperature	Asexual forms	Gametocytes	Total
6th April	101.4°F.	1,960	160	2,120
7th April	100.6°F.	2,080	160	2,240
8th April	N.	1,400	200	1,600
9th April	101.2°F.	6,280	160	6,440
10th April	101.4°F.	6,040	240	6,280
11th April	101.4°F.	7,900	340	8,240
13th April	101.2°F.	1,500	640	2,140
14th April	102.4°F.	1,120	160	1,280
15th April	99.4°F.	1,040	80	1,120
16th April	N.	2,020	160	2,180
17th April	101°F.	1,120	80	1,200
Now put on to cinchona febrifuge gr. x b.d., with alkalies.				
18th April	100.2°F.	1,120	160	1,280
19th April	N.	880	0	880
20th April	98°F.	Less than 40 per cmm.	0	Less than 40 per cmm.
21st April	100°F.	0	0	0
22nd April	98°F.	0	0	0
23rd April	N.	0	0	0
24th April	99°F.	0	0	0

Bass culture sterile on 5th May, 1931.

Treatment with insulin started on 6th May, 1931.

The patient was discharged on 22nd May, 1931.

Blood sugar 0.145 per cent.

Note.—The case presents several points of interest. It may be compared with the case of syphilitic paraplegia in a non-diabetic patient treated by induced quartan malaria detailed in our paper of 1930. In the present case, the counts were very much lower than in the former, and the induced malaria less severe (although we had expected high counts and a severe attack as the patient was a diabetic). On the other hand the counts are much higher than in non-diabetic cases 22 and 23 above. Gametocyte production in the untreated patient is seen to be continuous and at a fairly high level, when compared with the count of asexual forms.

It cannot be said that this case throws much light on the association of blood sugar content with the severity of the attack of malaria.

Case 26. Quartan malaria. Resistance to cinchona febrifuge.—Bhusan Chandra Fadikar, Hindu male adult,

was admitted to hospital on 9th March, 1931, with a history of fever of six months' duration. Films showed *P. malariae* infection present. Spleen just palpable, liver not palpable.

PARASITE COUNT PER C.M.M.

Date 1931	Temperature	Asexual forms	Gametocytes	Total
11th March	98.4°F.	1,440	2,320	3,760
12th March	104°F.	2,020	800	2,820
13th March	99°F.	4,160	160	4,320
14th March	98.4°F.	1,600	800	2,400
15th March	103.6°F.	Counts not done		
16th March	99.4°F.	1,880	240	2,120
Now put on to cinchona febrifuge gr. x t.d.s., with alkalies for ten days.				
17th March	98°F.	1,000	960	1,960
18th March*	102°F.	800	400	1,200
19th March	N.	530	270	800
20th March*	N.	0	160	160
(degenerating).				
21st March	N.	0	Very scanty, degenerating.	
23rd March*	N.	0	Very scanty, degenerating.	
24th March	N.	0	Very scanty, degenerating.	
25th March*	N.	0	0	0
26th to 30th March. Afebrile. No parasites seen.				
30th March. Bass culture sterile.				

Note.—The steady production of parasites during the untreated phase, with no tendency to spontaneous cure, is again evident in this case; also the steady output of gametocytes. Under cinchona febrifuge treatment asexual forms disappeared on the fourth day of treatment, but eight days' treatment was necessary before the gametocytes finally disappeared.

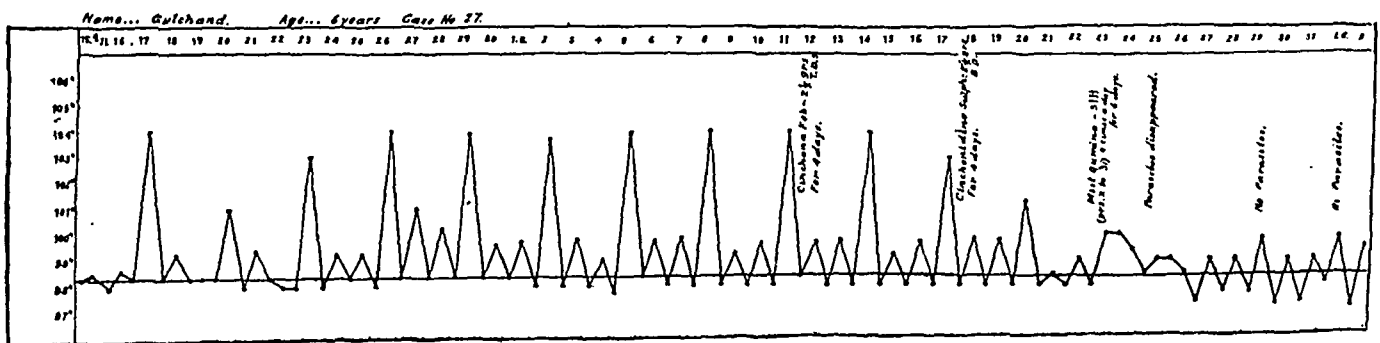
Case 27. Experimentally induced quartan malaria. Resistance to cinchona febrifuge and cinchonidine. Cure with quinine.—Gulchand, Hindu male child, six

PARASITE COUNT PER C.M.M.

Date 1931	Temperature	Asexual forms	Gametocytes	Total
15th April.	Parasites first appeared.			
23rd April	102.6°F.	1,040	240	1,280
24th April	99.6°F.	640	160	800
25th April	99°F.	1,160	80	1,240
27th April	100.4°F.	920	80	1,000
28th April	100.6°F.	1,120	160	1,280
30th April	98.2°F.	760	40	800
5th May	102.4°F.	560	160	720
6th May	100°F.	400	160	560
8th May	101°F.	120	40	160
9th May	N.	240	0	240
11th May	100°F.	240	40	280
12th May	98°F.	280	40	320
Now put on to cinchona febrifuge gr. 2½ t.d.s., with alkalies for four days.				
14th May	102.6°F.	800	80	880
16th May	99.2°F.	160	80	240
18th May.	Still febrile; treatment changed to cinchonidine sulphate gr. 2½ b.d., with alkalies for four days.			
20th May	100°F.	160	0	160
21st May	98°F.	160	0	160
22nd May	99°F.	80	80	160
23rd May	99°F.	80	0	80
Treatment changed; Mist. Quininae (gr. x ad oz.) dr. iii four times a day for six days.				
25th May to 2nd June. Afebrile; no parasites seen in thin and thick films.				
2nd June. Bass culture sterile. Dr. Bhattacharji is of opinion that there is a definite improvement in the patient's condition. There is not so much difficulty in walking, though the gait is not quite steady yet.				

Note.—During the untreated phase the temperature chart was rather erratic, as is usually the case in primary induced infections. There was a free production of gametocytes, but in the second week in May the parasite counts tended to diminish. The failure of cinchona febrifuge here contrasts with the immediate effect of quinine; possibly, however, the former was hardly given a long enough trial.

CHART IV



years of age, was admitted to hospital with spasticity of the legs of five months' duration. A year previously he had had what was apparently an epileptic fit. The Wassermann reaction was negative. It was decided to induce malaria. He received 1/4 c.cm. of blood from a case of quartan malaria showing a total count of 2,120 including 240 gametocytes per c.mm. on 16th March, 1931.

* Indicates that Meyer's test was applied to the urine, with positive findings; i.e., the alkaloids were being absorbed and excreted.

Case 28. Experimentally induced quartan malaria. High fever with low counts.—Mr. S., Anglo-Indian, aged 21 years, admitted to hospital on 18th April, 1931, for interstitial keratitis since November 1929. Wassermann reaction moderately positive. It was decided to induce malaria as a therapeutic measure.

18th April. Given 1/4 c.cm. of blood hypodermically from a donor with quartan malaria, showing a moderate infection. (Count not done).

Inoculation failed to take.

18th May. Re-inoculated with 1 c.cm. of blood hypodermically from another donor with quartan

malaria, parasite count 180 per c.mm., all asexual forms.

24th May. Temperature 100°F.; no parasites seen.

PARASITE COUNT PER C.MM.				
Date 1931	Temperature	Asexual forms	Gametocytes	Total
25th May	N.	Less than 40 per c.mm.	0	
27th May	95.4°F.	0	40	0
28th May	103.8°F.	80	0	80
30th May	N.	120	0	120
1st June	104°F.	40 (schizonts)	0	40
2nd June	N.	Very scanty *	0	
3rd June	N.	Very scanty *		
4th June	104.6°F.	40	0	40
5th June	N.	Very scanty *	0	
6th June	99°F.	Very scanty *	0	
7th June	104°F.	Very scanty * (schizonts).	0	
11th June	98°F.	0	Very scanty *	
12th June	N.	0	Very scanty *	
13th June	N.	0	Very scanty *	
15th June	103.2°F.	120	0	120
16th June	N.	Very scanty *	0	
17th June	100°F.	Very scanty *	0	
Put on to Mist. Quinine gr. x ad oz., one oz. b.d.				
22nd June	N.	Very scanty * (trophozoites).	0	
23rd June	N.	0	0	0

No Bass culture was taken, but the patient had no fever till the date of his discharge on 14th August, 1931. Malaria therapy did not seem to have any appreciable effect on the patient's condition.

Note.—This case is a very interesting one. In the first place it illustrates very well the presence of high fever in a quartan infection associated with very low parasite counts; had occasional examination of thin films alone been resorted to, the presence of parasites might easily have been missed. Secondly, there was almost no production of gametocytes, this again suggesting that there is some factor in the patient's constitution which determines whether he will produce gametocytes or not, or—to be more accurate—whether gametocytes will or will not appear in films of the peripheral blood. Finally, the infection was rather resistant to quinine, and parasites did not disappear until the sixth day of treatment; the dose given however was only 20 grains a day.

Infections with Plasmodium falciparum. 7 cases

Case 29. Spontaneous cure.—Ram Swarup, Hindu male adult, was admitted to hospital with a history of fever off and on for four months. The spleen was just palpable, the liver not palpable.

On admission on 1st February, 1932, very scanty rings of *P. falciparum* were detected in the films, less than 40 per c.mm.

2nd February to 15th February. No parasites seen in thin or thick films.

15th February. Bass culture sterile.

Note.—No treatment was given at any time. This sort of thing must be going on all over

India during the epidemic season, otherwise the population would be decimated.

Case 30. Moderate infection. Cinchona febrifuge, followed by Plasmochin.—Radha Govinda Saha, Hindu male, aged 25 years, was admitted to hospital on 5th February, 1931, with a history of fever off and on for seven months. The spleen and liver were not palpable.

PARASITE COUNT PER C.MM.				
Date 1931	Temperature	Asexual forms (rings)	Gametocytes	Total
7th February	N.	1,040	4,640	5,680
9th February	97.4°F.	80	3,120	3,200
11th February	N.	0	2,480	2,480
12th February	100.6°F.	1,360	1,120	2,480
Put on to cinchona febrifuge tablets, gr. x t.d.s., without alkalies.				
13th February	N.	320	2,160	2,480
14th February	N.	0	2,000	2,000
16th February	N.	0	1,920	1,920
17th February	N.	0	2,560	2,560
18th February	N.	0	2,080	2,080
19th February	N.	0	1,840	1,840
20th February	N.	0	1,600	1,600
21st February	N.	0	1,240	1,240
Cinchona febrifuge discontinued. No treatment.				
23rd February	N.	0	960	960
24th February	N.	0	640	640
25th February	N.	0	480	480
26th February	N.	0	160	160
27th February	N.	0	160	160
Given Plasmochin 0.01 gramme tablet b.d. for four days only.				
28th February	N.	0	960	960
2nd March	N.	0	80	80
3rd to 5th March. Afebrile. No parasites seen.				
5th March. Bass culture sterile.				

Note.—This case is a most instructive one. It well illustrates the conditions present in the terminal phases of a chronic malignant tertian infection, almost afebrile, with a low count of asexual forms, but abundant crescent production. (Such a patient must be an all-round danger in disseminating malaria). The residual asexual forms were immediately eradicated by cinchona febrifuge which, however, did not touch the gametocytes. Crescents were present continuously for the six days during which the asexual forms were present, and for 15 days at least after disappearance of the asexual forms. The almost immediate eradication of crescents by Plasmochin administration in very small doses for four days is very characteristic of the action of that drug.

The moral of such a case is that no hospital patient suffering from malignant tertian malaria should be allowed to leave hospital until he has had a short four-day course of Plasmochin treatment.

Case 31. Cinchona febrifuge followed by Plasmochin.—Bholanath Das, Hindu male adult, was admitted to hospital on the 18th February, 1931, with a history of intermittent fever of six months' duration. Films showed an infection with *P. falciparum*. Spleen palpable, liver not palpable.

* Indicates less than 40 parasites per c.mm.

PARASITE COUNT PER C.M.M.

Date 1931	Temperature	Asexual forms (rings)	Gameto- cytes	Total
19th February	101.4°F.	18,240	320	18,560
20th February	N.	5,060	480	5,540
21st February	104°F.	19,840	0	19,840
Patient put on to cinchona febrifuge gr. x t.d.s., with alkalies.				
23rd February	N.	0	640	640
24th February	N.	0	320	320
26th February	N.	0	480	480
27th February	N.	0	640	640
28th February	N.	0	1,280	1,280
Plasmochin 0.01 gramme b.d. added to treatment, for four days.				
2nd March	N.	0	0	0
3rd March	N.	0	0	0
Cinchona febrifuge discontinued.				
4th March	N.	Plasmochin discontinued.		
5th March.	Afebrile. No parasites in thin and thick films. Bass culture sterile.			

Note.—This case is a very instructive one. The dramatic and immediate effect of cinchona febrifuge on the asexual forms and on the temperature chart is well shown, but the drug does not touch the crescent count, which, if anything, increases. The effect of Plasmochin on the crescents is again immediate and dramatic. We have here a ten-day treatment for malignant tertian malaria which would appear to completely extirpate parasites from the patient's system.

Case 32. Atebrin plus Plasmochin.—Subal Chandra Chaudhuri, Hindu male, aged 30, was admitted to hospital on the 15th February, 1932, with a history of fever of six months' duration. Blood films showed the presence of *P. falciparum*. Spleen enlarged to 1½ finger-breadths below the costal margin, liver not palpable.

PARASITE COUNT PER C.M.M.

Date 1932	Temperature	Asexual forms (rings)	Gameto-cytes	Total
17th February	97°F.	0	160	160
19th February	97.8°F.	2,080	320	2,400
20th February	101.4°F.	4,160	640	4,800
Patient now given Atebrin, one tablet t.d.s., for four days.				
22nd February	N.	0	80	80
Plasmochin 0.01 gramme b.d. for four days added to treatment.				
23rd February	97.2°F.	0	360	360
24th February	N.	0	280	280
25th February	N.	0	Very scanty *	
26th February	N.	0	0	0
All treatment discontinued.				
27th February to 7th March. Afebrile. No parasites seen in thin and thick films.				
7th March. Bass culture sterile. Spleen not palpable. Patient discharged.				

Note.—This is again a very interesting case. The immediate effect of Atebrin on the asexual forms is as rapid as that of quinine, but it does not affect the crescents. These on the other hand yield at once to Plasmochin. Here we appear to have a four-day treatment for malignant tertian malaria, administered in tablet form, which eradicates all parasites within that short space of time, with no inconvenience to the patient.

* Indicates less than 40 parasites per c.mm.

Case 33. Atebrin plus Plasmochin.—Haribulla Chatterji, Hindu male adult, was admitted to hospital on the 4th February, 1932, with a history of fever of five months' duration. Blood films showed innumerable rings of *P. falciparum* with scanty crescents. The spleen was palpable, the liver not enlarged.

PARASITE COUNT PER C.M.M.

Date 1932	Tempera- ture	Asexual forms (rings)	Gameto- cytes	Total
5th February	105.4°F.	12,800	40	12,840
6th February	98°F.	8,600	0	8,600
Patient now given (i) Atebrin, one tablet t.d.s., for four days, plus (ii) Plasmochin, 0.01 gramme b.d. for two days.				
8th February	98°F.	480	0	480
9th to 15th February. Afebrile. No parasites seen.				
15th February. Bass culture sterile. Spleen not palpable. Patient discharged.				

Note.—In this case again it would appear that the Atebrin plus Plasmochin treatment is very efficacious.

Case 34. Experimentally induced malignant tertian malaria.—Sona, male adult, sweeper, aged 20 years. This patient was experimentally infected by feeding infected *A. stephensi* on him on 12th January, 1932. Parasites first appeared in films on the 25th January, 1932, and quinine gr. x b.d. was given for four days only. Fever disappeared for the time being, but he relapsed on the 19th February. On the 26th February Dr. Strickland very kindly made over the patient to us for treatment. At this stage blood films showed scanty rings and numerous crescents; the spleen was enlarged to 1½ finger-breadths below the costal margin, the liver was not palpable.

PARASITE COUNT PER C.M.M.

Date 1932	Temperature	Asexual forms (rings)	Gameto-cytes	Total
27th February	100.4°F.	40	1,200	1,240
Atebrin, one tablet only, to test effect on crescents.				
29th February	N.	40	960	1,000
Atebrin, one tablet b.d.				
1st March	N.	0	1,280	1,280
2nd March	98°F.	0	920	920
3rd March.	Given Atebrin, one tablet t.d.s. for four days plus Plasmochin 0.01 gramme b.d. for two days.			
4th March	N.	0	960	960
5th March	N.	0	Very scanty *	
6th to 8th March. Afebrile. No parasites seen.				
8th March. Discharged. Spleen not palpable.				

Note.—The four days' treatment with quinine was quite insufficient to control the infection, and relapse occurred. The single dose of Atebrin on the 27th February and the small doses on the 1st and 2nd March were given to see whether Atebrin had any direct effect on crescents; as will be seen, it had no effect, and, just as with cinchona febrifuge or quinine, in cases of malignant tertian malaria treatment with Atebrin should be supplemented by a short course of Plasmochin in order to eradicate crescents.

Case 35. Quinine hæmoglobinuria. Cure by Quinidine.—Kamalesh Chandra Roy, Hindu male child, aged 10 years, was admitted to hospital on the 23rd April, 1931, with a history of fever and the onset of hæmoglobinuria every time he took quinine.

23rd April. Temperature normal; no parasites seen.
24th April. Temperature 99.4°F.; parasite count 4,080—rings only.

* Indicates less than 40 parasites per c.mm.

25th April. Temperature normal; no parasites seen. Quinine sulphate in solution, gr. 1/50th every half hour. After 25 doses—total 1/2 gr. of quinine—the patient commenced to pass 'smoky' urine. Quinine discontinued; calcium lactate and parathyroid given.

27th April. Temperature 98°F.; no parasites seen.

28th April. Temperature 95°F.; very scanty rings in films.

30th April. Temperature 98°F.; parasite count 160 rings per c.mm. Quinidine sulphate given every half hour in rising doses. gr. 1/64, gr. 1/32, gr. 1/16, gr. 1/8.

1st May. Temperature 99°F.; parasite count 240 rings per c.mm. Quinidine sulphate gr. 1/8 t.d.s.

2nd May. Temperature normal; no parasites seen. Quinidine sulphate gr. 1/6 t.d.s.

3rd May. Temperature normal; no parasites seen. Quinidine sulphate gr. 1/3 t.d.s.

4th May. Temperature normal; no parasites seen. Quinidine sulphate gr. 1/3 t.d.s.

5th May. Temperature 99.6°F. Parasite count 720 rings per c.mm. Quinidine sulphate gr. 1/2 t.d.s.

6th May. Temperature 98°F. Parasite count 1,440 rings per c.mm. Quinidine sulphate gr. i t.d.s.

7th May. Quinidine sulphate gr. ii t.d.s. (Counts not done).

8th May. Temperature 103.2°F. Parasite count 840 rings per c.mm. Quinidine sulphate gr. ii t.d.s.

9th May. Temperature 98.4°F. Parasite count 1,040 rings per c.mm. It was now clear that nine days' treatment with quinidine had failed to eradicate the infection. Cinchonidine sulphate gr. 1/4, gr. 1/2, gr. i, gr. ii, gr. iv, given at hourly intervals, with alkalies every four hours. Began to pass 'smoky' urine after the last dose.

10th May. No parasites seen.

11th May. Scanty rings in films.

12th May. No parasites seen. Quinidine sulphate gr. 1/2, gr. i, gr. ii, gr. iv, given at hourly intervals.

13th May. Afebrile; no parasites seen. Quinidine sulphate grs. iii b.d.

14th to 18th May. Afebrile; no parasites seen. Quinidine sulphate grs. iv b.d.

19th to 25th May. No treatment. Afebrile. No parasites seen.

26th May. Quinine sulphate, gr. 1/4 every two hours for 8 doses with alkalies every 4 hours.

27th May. Quinine sulphate, gr. i every two hours for 8 doses.

30th May. Quinine sulphate, grs. ii, sodium bicarbonate, grs. v, every two hours for 6 doses.

31st May. Quinine sulphate, grs. iii every three hours for 4 doses.

1st June. Discharged.

We received a letter from the patient's uncle on 8th April, 1932, to say that the boy has had no fever since he was discharged from hospital.

Note.—This case illustrates very well the value of quinidine in cases of hæmoglobinuria.

Mixed infection. 3 cases

Case 36. *P. vivax* plus *P. malariae* infection. *Atebrin* treatment.—Abdul Sattar, Mahomedan male child,

aged 10 years, was admitted to hospital on the 24th March, 1932, with a history of fever for the past five months—almost continuously for the past month. The child was extremely anæmic. Blood films showed the presence of both *P. malariae* and *P. vivax* infections, the former predominating. The spleen was enlarged to 4 inches below the costal margin, the liver not palpable.

Date 1932	Temperature	Parasite count per c.mm.
25th March	N.	880; chiefly Q, gametocytes and trophozoites.
26th March	N. at noon when count taken. Rigor at 6 p.m.	920; chiefly Q, schizonts and scanty gametocytes.
28th March	N.	Q; gametocytes and trophozoites. B. T.; scanty schizonts.
29th March	N. at noon when count done. Rigor at 6-45 p.m.	1,040; chiefly Q, schizonts and scanty gametocytes.
31st March	N.	B. T. 980; Q 780; total 1,760. Given Atebrin, one tablet b.d., for six days.
1st April	99°F. at noon when count done. 105°F. at 6 p.m.	B. T. 1,280. Q 560, of which 80 are gametocytes. Total 1,840.
2nd April	99°F.	0
3rd April	100.6°F.	0
4th April	99.2°F.	0, but pigment bearing leucocytes present.
5th April	101.4°F.	0
6th April	102°F.	0
7th April	103.2°F.	0

On this date a measles rash developed all over the body.

14th April. Afebrile. No parasites seen in thin and thick blood films.

Spleen only just palpable. Bass culture was not taken at the time of discharge, but we are informed by the boy's father that the boy has had no fever till the date of writing this note, i.e., 16th May, 1932.

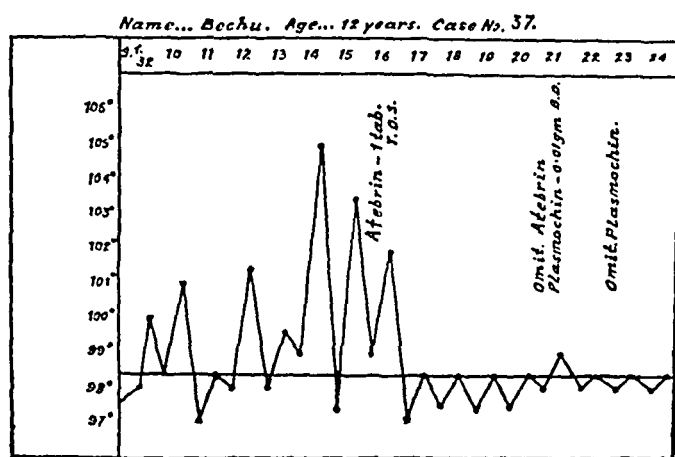
Note.—This case presents several points of interest. It is rather unusual in a mixed infection with both species for *P. malariae* to predominate over *P. vivax*, as was the case here. The immediate effect of Atebrin in eradicating all forms of both species of parasite was very striking. In spite of this the temperature kept up (for which reason Atebrin was continued for six, instead of the usual four, days). On the 7th April the reason for this disclosed itself, when the child developed measles. Atebrin is not a prophylactic against measles.....!

We doubt whether either cinchona febrifuge or quinine would have brought about so very rapid an eradication of parasites in such a mixed infection.

Case 37. *P. vivax* plus *P. falciparum*. *Atebrin* followed by *Plasmochin*.—Bechu, Hindu male child, aged 12 years, was admitted to hospital on the 9th January, 1932, with a history of fever off and on of four

months' duration. The spleen was enlarged to 4 finger-breadths below the costal margin, and the liver just

CHART V



palpable. Examination of blood films showed what appeared to be an infection with *P. vivax* only.

Date 1932	Temperature	Parasite count per c.mm.
12th January	99.4°F.	1,840; B. T. trophozoites only.
13th January	98°F.	8,880; B. T. rings and trophozoites.
14th January	102.6°F.	33,400; B. T., chiefly rings, scanty trophozoites and gametocytes.
15th January	102°F.	1,600; B. T. rings and trophozoites.
16th January	99°F.	120; B. T. rings.
Patient put on Atebrin one tablet t.d.s. for four days.		
18th January	98°F.	B. T. 0; M. T. 80 crescents per c.mm.
19th January	98.2°F.	B. T. 0; M. T. 40 crescents per c.mm.
21st January	98°F.	B. T. 0; M. T. 40 crescents per c.mm.
Plasmochin 0.01 gramme b.d. for two days.		
23rd January	97°F.	No parasites in thin and thick films.
Plasmochin discontinued.		
24th January.	No parasites seen in thin and thick films. Bass culture sterile. Spleen only just palpable. Patient discharged.	

Note.—This case is a very interesting one. The first six examinations of the blood over eight days failed to disclose the infection with *P. falciparum*. Crescents only appeared after the administration of Atebrin; it is clear that Atebrin has no effect on crescents, it may even lead to their reappearance in the peripheral blood. The *P. vivax* infection was immediately eradicated by Atebrin, and the gametocytes of *P. falciparum* by Plasmochin. Seven days after treatment was begun the patient was discharged with both infections apparently exterminated; the treatment throughout was by tablets, easily taken and readily tolerated.

Case 38. *P. vivax* plus *P. falciparum* infection. Atebrin plus Plasmochin. Rapid cure. Icterus on Atebrin administration.—Abdul Malik, Mahomedan male, aged 14 years, was admitted to hospital on the 28th January, 1932, with a history of fever for the last year and a half, for the past sixteen days with daily rigors at about 4 p.m. Examination of blood films showed a moderately heavy infection with *P. vivax*,

with gametocytes of *P. falciparum* also present. Spleen enlarged to 2½ finger-breadths below the costal margin, liver not palpable.

Date 1932	Temperature	Parasite count per c.mm.
28th January	99.4°F.	B. T. 6,960; crescents 40; total 7,000.
29th January	98°F.	3,800; M. T. and B. T. rings and very scanty crescents; total 3,800.
30th January	99°F.	480; chiefly M. T. rings and very scanty crescents; total 480.

Given Atebrin one tablet t.d.s. for four days.

1st February N. 80; all crescents. Plasmochin 0.01 gramme b.d. for two days added.

2nd February N. Very scanty crescents.*

8th February. Developed a yellow tinge of the skin and conjunctivæ; this spontaneously cleared up within three days.

3rd to 22nd February. Afebrile; no parasites seen.

22nd February. Bass culture sterile. Spleen not palpable. Discharged.

Note.—In this case again the immediate eradication of all asexual forms by Atebrin, and of crescents by Plasmochin is well seen. The icterus which developed after Atebrin was not a true jaundice; it was not accompanied by any of the other features of catarrhal jaundice, such as itching of the skin, a slowing of the pulse, bile pigment in the urine, etc.; in fact the patient was unaware of it until his attention was directed to it. It was rather a staining of the skin due to some change in the metabolism of the drug. The manufacturers of Atebrin draw attention to the possible occurrence of such icterus, but it is very transient and wears off in a few days. It is the one and only complication of Atebrin treatment that we have so far seen.

* * * * *

Discussion

We do not propose at this stage of our investigation to enter upon statistical analysis of our findings, as the material collected is still insufficient. In due course of time, however, this may be possible.

If we take our two papers of 1930 and 1931, together with the present series of cases, however, there emerge certain findings of a general nature on which we should like to comment. These are as follows:—

1. The tendency to spontaneous cure in malaria

This, of course, is a commonplace, yet it is as well to have it confirmed by enumerative and cultural studies. The case mortality in malaria probably does not exceed 1—or at the most 2—per cent.; though the amount of sickness and invalidism which the disease causes in the tropics is immense.

This tendency to spontaneous cure is especially well seen in infections with *P. vivax*—

* Indicates less than 40 parasites per c.mm.

cases 16, 17 and 18. This spontaneous apparent cure, however, is often (or perhaps usually) followed by relapse—case 3. Spontaneous cure without treatment in infections with *P. falciparum* is also shown in cases 7, 15 and 29.

In infections with *P. malariae*, however, conditions are entirely different; the infection persists for a very long period of time. In the early phases of a quartan infection one often finds high fever associated with relatively low parasite counts—case 28. Later, one gets an afebrile or almost afebrile condition, associated with persistent infection and low counts—cases 22, 23, 24, 25, 26 and 27. Such infections are apt to prove rather resistant to cinchona or quinine treatment, which has to be pushed to full doses for at least ten days to eradicate the infection.

These facts are of importance when it comes to the testing of new remedies for malaria. In six of the above quoted cases, had any drug at all been used, it could be claimed to be a 'cure' for malaria. In testing a new remedy only such cases should be selected as show progressive fever, or at least a well marked febrile state, associated with a high or progressively increasing parasite count, e.g., cases 1 and 2 as examples.

In reality, it is very difficult to assess the value of a new remedy by trial in a general hospital in Bengal. Patients will not stay in hospital long enough, they are not under strict discipline, and it is difficult to follow them up afterwards; also the chances of re-infection when they return to their homes in the *mofussil* of Bengal may be very considerable. Trials of new remedies should be undertaken in populations subject to discipline, and where the previous medical history is known. In the Army, for instance, where every soldier has a medical case history sheet, and is under discipline, conditions for testing a new remedy are excellent. Also in jails, and in such institutions as leper hospitals, where patients can be placed under observation for long periods of time, conditions are suitable. Hill station depots, where re-infection is impossible, again afford good opportunities for testing new remedies—although here the cases are almost all instances of relapsing benign tertian malaria, since the cases of malignant tertian malaria are cured in the plains by quinine administration, whilst there are very few military stations in India in quartan-infected areas (Knowles and Senior White, 1930).

On the other hand, we would emphasise the value of enumerative and cultural studies in such work. As a final test as to whether the infection has been completely eradicated, since there is no susceptible animal which we can inoculate, we suggest the taking of a Bass culture with 5 c.cm. of the patient's blood. If this proves sterile, it is at least reasonably probable that the infection has been exter-

minated. So far we have had reported to us only one instance of relapse after such a finding—a Hindu child from the *mofussil*, who may easily have been re-infected after she returned to her home.

2. Biological factors in gametocyte production

The old-fashioned view that gametocyte production is a response by the parasite to increasing resistance on the part of the host will certainly have to be given up. Evidence is steadily accumulating that gametocytes are often produced in large numbers quite early in the infection; this is particularly well seen in cases where malaria has been induced as a therapeutic measure. Examples are case 18 in a *P. vivax* infection; case J. R. of our 1930 paper, and cases 25 and 27 of the present series in *P. malariae* infections—all experimentally induced.

There appears to be some evidence that there is some biological factor in the individual's metabolism which determines whether he will or will not show abundant gametocytes. Some individuals are good gametocyte-producers, if the term may be allowed; others are poor gametocyte-producers, or at least fail to show gametocytes in the peripheral blood. We have no figures on this point for *P. vivax* infections. In connection with *P. malariae* infections there was abundant production of gametocytes in case J. R. of our 1930 paper, and in cases 22, 23, 25, 26 and 27 of the present series; on the other hand in case 28 there was almost no output of gametocytes. The finding is even better brought out in infections with *P. falciparum*; abundant production of gametocytes early in the infection is shown by cases 4, 5, 6 and 34. On the other hand cases 8, 9, 10 and 14 failed to show gametocytes. Late—or as we may term them 'residual'—infections with *P. falciparum* are associated with an afebrile state, a complete or almost complete dying out of the asexual cycle, but abundant crescents in the peripheral blood; instances are cases 12 and 30.

That *P. falciparum* infections result in an abundant production of crescents in some countries, whereas in other countries crescent production is at a minimum has been shown in the data collected by Knowles and Senior-White (1930).

One of the most important unsolved problems in malaria is the study of the biological factors—individual, climatic, and other—associated with variations in gametocyte production.

3. The action of different drugs on gametocytes

This matter is of very great importance from the point of view of the prevention of malaria. We will not enter here into a review of the enormous amount of literature on it; the number of papers published on Plasmochin alone now exceeds 500, and it would take six months' work to assay the position. Only a few points

which emerge from the study of our own cases alone will be mentioned.

That quinine and the cinchona alkaloids destroy the gametocytes of *P. vivax* is a well known fact; unfortunately we have no example of this in our series, as Plasmochin was administered in all such cases in addition to cinchona alkaloids. The destruction of the gametocytes of *P. malariae* by cinchona alkaloids is well illustrated in our series by case J. R. of our 1930 paper, and cases 22, 23, 24, 25 and 26 of the present series. That the cinchona alkaloids do not affect the gametocytes of *P. falciparum*, and that their administration may even be accompanied by a marked increase in the number of crescents in the peripheral blood, is again a well known fact; instances in our series are cases 6, 12, 13, 30 and 31.

Atebrin rapidly exterminates all forms of both *P. vivax* and *P. malariae*. This is shown in cases 19 and 20 of the present series for *P. vivax*; and in case 36 for a mixed infection with *P. vivax* and *P. malariae*. In *P. falciparum* infections the asexual forms are rapidly destroyed, but the crescents are unaffected; examples are cases 32, 33 and 34. In cases 37 and 38, where a mixed infection with *P. vivax* and *P. falciparum* was present, the administration of Atebrin rapidly cleared all forms of *P. vivax* and the asexual forms of *P. falciparum*, but left the crescents unaffected. The action of this drug in malaria is thus exactly similar to that of the cinchona alkaloids.

The literature on Plasmochin is too enormous to review in this paper. Two very important papers with regard to it, however, cannot be passed over. Sinton and Bird (1928) conclude that the discovery of Plasmochin marks a distinct advance in the treatment of malaria, but quote Manson-Bahr as saying that this drug should be 'regarded as the beginning, not the climax, of a new series of anti-malarial drugs'. They find that Plasmochin is much more effective in producing a permanent cure in benign tertian malaria and in abolishing crescents from the peripheral blood than quinine, but in the treatment of attacks of malignant tertian malaria the latter drug is still the treatment of choice. Finally, 'the low margin of safety in the dosage of Plasmochin renders it necessary that further experiments should be carried out to determine the best dosage and duration of treatment, before the drug is issued for general use outside hospitals'.

Such further experiments on a very large scale were carried out under the direction of Manifold (1931) on the British Army in India. The official orders for treatment were: for benign tertian cases to give quinine gr. x with Plasmochin 0.02 gramme, one tablet, b.d. for 21 days; for malignant tertian cases to give the usual routine treatment by quinine, supplemented during the last five days of treatment by Plasmochin 0.04 gramme daily, with a view

to destroy crescents. Collected statistics are given for 3,187 patients who underwent a complete course of such treatment. Toxic symptoms were noted in 21 per cent. of the British troops treated and in 10 per cent. of Indian troops treated, but were only very rarely of any severity. The most striking effect of Plasmochin administration was the tremendous reduction in the relapse rate in patients suffering from benign tertian malaria. Thus Sinton, Smith and Pottinger (1930) at Kasauli recorded a relapse rate of 42 per cent. in such cases receiving the usual course of quinine treatment, as compared with one of 8 per cent. for quinine plus Plasmochin. In Manifold's collected figures the average relapse rate for all stations was 5.2 per cent., and if only cases relapsing after the end of the malaria season be regarded as true relapses the rate was as low as 2.4 per cent. These figures are so remarkable that a very great reduction in malaria incidence in the Army in India may confidently be anticipated when the treatment comes into general use.

We confess that personally we have rather tended to confine Plasmochin treatment to such patients as showed crescents in their blood. Of the few cases that we have treated only one—case 11—showed toxic symptoms; here Plasmochin administration had to be discontinued on account of epigastric pain. In case 21—an infection with *P. vivax*—relapse occurred after Plasmochin administration, but here the dosage given was probably insufficient. For straightforward cases of benign tertian and quartan infections we do not consider that Plasmochin is preferable to the cinchona alkaloids or to Atebrin, and its possible toxicity must always be borne in mind.

On the other hand, the action of Plasmochin in destroying crescents is very remarkable indeed, and there is no other drug in this respect to compare with it. Its action can easily be studied with the microscope; after the very first dose the crescents can be seen to be degenerating. In our 1931 paper we advocated a dosage of 0.01 gramme daily for six days; in our present series of cases it will be seen that a total dosage of 0.04 gramme—given either as 0.01 gramme b.d. for two days, or as 0.02 gramme once daily for two days—is usually sufficient to destroy all crescents. Examples are cases 4, 5, 6, 9, 11, 12, 13, 30, 31, 32, 34, 37 and 38.

In our opinion Plasmochin administration should be reserved for cases of infection with *P. falciparum*, but in all such cases the patient should not be allowed to leave hospital without a short two or four-day course of minimal amounts of Plasmochin. To render the patient afebrile by cinchona febrifuge or quinine and then to turn him loose on the countryside with his blood loaded with crescents is to inflict a distinct danger on the community.

(At present the smallest tablet of Plasmochin available on the market contains 0.02 gramme of the drug. We are much indebted to Dr. O. Urehs of the Haverro Trading Co. for procuring for us a special supply of tablets of strength 0.01 gramme, and we hope that this dosage in tablet form will be put upon the market).

4. A note on anti-malarial drugs in blackwater fever

The controversy as to whether quinine should or should not be prescribed in cases of blackwater fever is a very old one, and we do not propose to enter into it here. There are obviously cases where the administration of quinine brings on the hæmoglobinuria, where quinine cannot be given. Yet the practitioner should realise that there are other anti-malarial drugs which may be prescribed in such cases. Colonel Acton has recommended the trial of quinidine in such patients, and case 35 of the present series illustrates this. In this patient the administration of either quinine or cinchonidine—both of which are lævo-rotatory alkaloids—brought on hæmoglobinuria, whereas the administration of quinidine, which is dextro-rotatory, cured the condition. Another alternative which may be successful is to prescribe Atebrin (Das Gupta, 1932).

Alternative treatments in malaria

The treatment of malaria by cinchona febrifuge or its alkaloids has stood the test of three hundred years, and to-day 'malaria' and 'quinine' are invariably linked together in the minds of both layman and physician. Why it should be 'quinine' and not 'the total crystallisable alkaloids of cinchona bark' it is difficult to say; the latter are as effective as the former, are very much cheaper, and more easily extracted. But quinine has become the fashionable drug, and quinine alone is therefore usually prescribed.

The layman will probably go on using proprietary remedies in the treatment of malaria for ever, and the Calcutta bazaars are full of stocks of patent fever mixtures. Here, however, we will confine our remarks to standard remedies.

The introduction of new synthetic drugs for the treatment of malaria, by German chemists, is not the result of chance but of many years of patient research work. This work began during the Great War when Germany and her allies could not obtain stocks of quinine, and her chemists therefore set about trying to produce synthetic drugs which should be as good or even better. The results to date are Plasmochin and Atebrin. With regard to the former, we have already indicated our opinion as to its use and the indications for its administration. With regard to Atebrin, the number of cases which we have treated hitherto has been small, but the more we see of the drug the more we like it. We will not say more than

that, but if we are within sight of a four-day treatment in tablet form by Atebrin and Plasmochin, which will eradicate parasites in all three forms of malaria infection, the next few years may see a revolution in our treatment of malaria, as well as an important advance in prophylaxis against the disease.

In Table I we give details of what we may consider to be the three standard treatments now in vogue for malaria, together with similar details of an additional or supplementary short course of Plasmochin for cases of malignant tertian malaria.

Conclusions

The following findings are illustrated in a study of our series of cases:—

1. The tendency to spontaneous cure and disappearance of parasites without treatment in cases of infections with *P. vivax* and *P. falciparum*.

2. Cases of infection with *P. malariae* do not show this tendency. Here what occurs is (a) a stage of fever, and often high fever, associated with relatively low parasite counts, followed by (b) a very prolonged period during which the patient is afebrile, but a low grade of parasite infestation continues.

3. Gametocyte production may appear quite early in infections with *P. vivax* and *P. malariae*, and the old-fashioned view that gametocytes are only produced at a late phase when the patient's resistance to infection is rising is certainly incorrect.

4. There appears to be some biological factor in the individual which affects the production or non-production of gametocytes. Some individuals are good 'gametocyte-producers', others are poor 'gametocyte-producers'.

5. Gametocytes are usually produced in relatively large numbers in infections with *P. malariae*. The old-fashioned view that gametocytes of this species are very rare findings is certainly wrong.

6. In cases of blackwater fever where administration of quinine precipitates hæmoglobinuria, the practitioner should remember that there are anti-malaria drugs other than quinine which may be safely prescribed. Of these two which appear to be specially suitable are quinidine and Atebrin.

7. The rôle of Plasmochin as an adjuvant to the cinchona alkaloids in the treatment of benign tertian malaria has been stressed by previous workers. On the other hand we do not believe the widespread administration of this drug in full doses in infections with *P. vivax* and *P. malariae* to be altogether safe.

8. In all cases of malignant tertian malaria, however, no patient should be allowed to leave hospital without undergoing a short terminal course of Plasmochin therapy to eradicate crescents. There is no other drug with anything like this effect. A course of 0.01 gramme

TABLE I
Comparison of different methods of treating malaria

Drug	Retail cost	How administered	Duration of treatment	Cost of one course of treatment	Advantages	Disadvantages
I. Cinchona febrifuge.	Rs. 14 per lb.	Gr. x t.d.s.—preferably with alkalis.	10 days ..	10 annas	(i) Cheapness. (ii) Cure rate with 3 weeks' course of treatment in B. T. malaria without relapse 50 per cent. (Acton <i>et al.</i> , 1921). (iii) Suitability for mass treatment of labour forces, etc.	(i) Bitter taste. (ii) May cause nausea and sometimes actual vomiting. (iii) Composition uncertain. This could be remedied by using a standardized preparation. (iv) Can only be given orally, and is therefore useless in emergencies. (v) Less efficient than quinine in M. T. infections. (Acton <i>et al.</i> , 1921). (vi) Not well tolerated by pregnant women. (vii) Is not a 'crescenticide'. (viii) Cinchonism. (ix) Uncertainty of absorption in tablet form.
II. Quinine sulphate.	Rs. 21 per lb.	Gr. x b.d. in solution*—preferably with alkalis.	10 days ..	10 annas	(i) Cure rate without relapses in M. T. infections 90 per cent. with a month's course of treatment. (Acton <i>et al.</i> , 1921). (ii) Can be administered by intramuscular or intravenous routes when oral administration is impossible, using the hydrochloride or hydrobromide. (iii) Less likely than cinchona febrifuge to cause nausea and vomiting.	(i) Cure rate in B. T. infections only 25 to 30 per cent., even after two months' course. (Acton <i>et al.</i> , 1921). (ii) Possibly contra-indicated in late pregnancy. (iii) May precipitate hæmoglobinuria in certain patients. (iv) Individual susceptibility to the drug occurs. Certain patients cannot take quinine. (v) Taste unpleasant. (vi) No action on crescents. (vii) Cinchonism.
III. Atebrin.	Rs. 3-6-0 for a bottle of 20 tablets† of 0.1 gramme each.	One tablet t.d.s.	4 days ..	Rs. 2	(i) Tasteless in tablet form. (ii) No individual susceptibility so far noticed. (iii) No cinchonism or any of the toxic manifestations which sometimes follow cinchona febrifuge or quinine.	(i) Its cost.† (ii) Occasional icterus, but of a transient and non-toxic character. (iii) Has no action on crescents.

* Quinine gr. x in solution b.d., because very few Bengali patients will tolerate larger doses. In robust individuals, troops, etc., the dosage may be pushed to gr. x t.d.s. in solution for ten days, with advantage.

† It is to be hoped that this price will be reduced if there is any extensive demand for the drug.

TABLE I—concl'd

Drug	Retail cost	How administered	Duration of treatment	Cost of one course of treatment	Advantages	Disadvantages
III. Atebrin— (concl'd.)					(iv) Eradicates all forms of <i>P. vivax</i> and <i>P. malariae</i> ; also the asexual forms of <i>P. falciparum</i> . (v) Given on two occasions to pregnant women without any untoward symptoms. (vi) Appears to be specially indicated in cases of blackwater fever.	
IV. Plasmochin (considered solely as a crescenticide, and as a supplementary treatment to treatments I, II or III).	Rs. 3-2-0 for a bottle of 25 tablets, each of 0.02 gramme.	0.01 gramme b.d. daily. (Should perhaps be reserved for infections with <i>P. falciparum</i>).	2 days. (May be given simultaneously during the last 2 days of treatments I, II or III; or may be given subsequently).	4 annas	(i) Is the only drug which we possess at present for destroying crescents and thus preventing the 'cured' patient from being a disseminator of the disease. The course indicated appears to be sufficient to eradicate crescents.	(i) Its cost if used otherwise, i.e., in the general treatment of all cases of malaria of all types in large doses. (ii) Its possible toxicity. This appears to be quite independent of the dose administered and to depend on individual idiosyncrasy. (iii) The question of its suitability or otherwise for wholesale administration outside hospitals may be said to be still <i>sub judice</i> .

tablet b.d. for two days is usually sufficient to destroy all crescents in the peripheral blood.

9. The position of Atebrin in the treatment of malaria is now becoming clear. In doses in tablet form of 0.1 gramme t.d.s. for four days it destroys all phases of *P. vivax* and of *P. malariae*; also the asexual forms of *P. falciparum*. The action of this drug is thus exactly similar to that of the cinchona alkaloids, whilst it is tasteless and the course of treatment required is only four days. Much further study with this drug is wanted. The chief drawback to it at present is its very high price.

Acknowledgments

We cannot conclude this paper without acknowledging our grateful thanks to Lieut.-Col. H. W. Acton, C.I.E., I.M.S., Director of the Calcutta School of Tropical Medicine, for his constant help and advice in the enquiry. Our thanks are also due to our colleagues on the staff of the School for placing patients at our disposal for observation and treatment.

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DYSENTERY IN BURMA (MILITARY STATIONS) WITH A NOTE ON SOME POST-DYSENTERIC INFECTIONS

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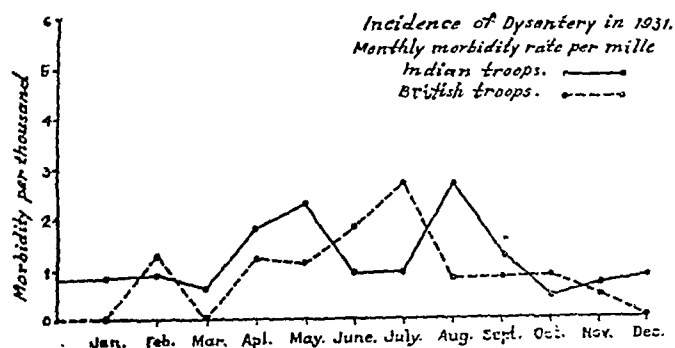
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NUMEROUS observers in the East have stressed the importance and prevalence of bacillary dysentery, particularly when due to infections with the *B. flexner* group. This statement has been corroborated from time to time by various workers in several parts of India. The following summary of results obtained during 1930-31 in the Military District (comprising mainly Mingaladon, Rangoon, Mandalay and Maymyo) is in line with other findings, in spite of the belief among some local medical practitioners that in Burma the protozoal infections play quite an important part in the incidence of dysentery.

The monthly incidence of dysentery among British and Indian troops during 1931 is shown in the attached graph. The figures on the graph represent the monthly morbidity rate per thousand and show that the disease is prevalent amongst the Indian troops throughout the year.



Laboratory technique.—The standard technique employed by all the military laboratories in India was used in dealing with the stools containing blood and mucus. A brief summary of the methods in vogue is as follows:—

(1) The stool, after testing the reaction with litmus paper, is examined microscopically for its exudate. From the stool a little of the mucus is picked up on a platinum loop, stirred in a test tube of sterile saline (to remove any extraneous bacteria, etc.) and plated out on bile-salt-litmus lactose-agar. After 24 hours incubation, suitable colonies are picked out and tested

for motility by a hanging drop preparation; on their proving non-motile they are transferred to glucose and mannite sugar media containing Andrade's indicator. The organisms fermenting glucose or glucose and mannite are further inoculated from these tubes into lactose, dulcitol, and peptone tubes (for the indol reaction). Finally, serological reactions are used to confirm the result of the biochemical reactions.

(2) No diagnosis of amoebic dysentery is based on the exudate alone and, if in addition to the pathogenic amoebæ, a bacillary type of exudate is present, an attempt is always made to isolate the causative bacilli by the cultural methods detailed above. The presence of a scanty exudate, consisting of a few lymphocytes and eosinophile cells, sometimes with Charcot-Leyden crystals is taken as an indication for a prolonged search, hence attention is always concentrated in such cases on finding the *Entamoeba histolytica*.

Adopting the above methods we obtained the following results:—

1. Total number of cases with mucus or blood and mucus 269.
2. Number of cases from which *B. dysenteriae* were isolated—126.
3. Number of cases in which *Entamoeba histolytica* was found—34.
4. Number of cases showing bacillary exudate but pathogenic amoebæ or bacilli were not found—46.
5. Number of cases showing indefinite exudate—106.

Taking the above figures into consideration of all the cases showing mucus and blood we find that:—

(a) 63.9 per cent. were of bacillary origin (including those from which *B. dysenteriae* were isolated and those showing bacillary exudate).

(b) 12.6 per cent. were of amoebic origin.

The rest, 23.5 per cent., were classified as indefinite (no specific exudate, no pathogenic amoebæ or cysts or dysentery group of organisms having been detected).

Of the 172 'bacillary' cases noted above *B. dysenteriae* was isolated from 73.2 per cent., or taking the indefinite exudate into consideration from 53.6 per cent.

The following summary shows the variety of the organisms encountered:—

Total number of cases from which <i>B. dysenteriae</i> were isolated	..	126
Number of cases showing <i>B. flexner</i>	..	102
" " " " <i>B. shiga</i>	..	11
" " " " <i>B. schmitz</i>	..	8
" " " " <i>B. sonnei</i>	..	3
" " " " <i>B. morgan</i> No. 1	1	1
" " " " <i>B. carolinus</i>	..	1

Regarding the classification of streptococci it may be mentioned that main reliance has been placed on the hæmolysis and fermentation of lactose, mannite, and salicin. The biochemical reactions of other sugars differ from the recognised strains, but it cannot be definitely asserted that these strains in question are distinct entities. The following is a description of the four cases which could be followed up:—

Case 1.—N., a middle-aged lady, was suffering for the last four years from intense itching at night. There was a transitory dark pink macular eruption which

TABLE I

Strain	Morphology	Hemolysis	Lactose	Mannite	Salicin	Glucose	Dulcitol	Saccharose	Maltose	Inulin	Inositol	Adonite	Galactose	Larvulose	Dextrin	Indol	In streptococci identification based on hemolysis, lactose, mannite and salicin only	Clinical signs
W	Short chains ..	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>S. mitis</i>	Diarrhea, history of <i>B. sonne</i> infection previously.
CI	Do.	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>S. faecalis</i>	? Sprue, anemia, etc.
II	Do.	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>S. mitis</i>	Anorexia, epigastric distress and diarrhea.
M	Do.	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>S. ignavus</i>	
MS	Do.	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>S. mitis</i>	Do.
B	Long chains ..	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>S. equinus</i>	Do.
P ₁	Short chains ..	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>S. mitis</i>	'Prospue' condition diagnosed by his doctor.
P ₂	Do.	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Do.	Diarrhea and dyspepsia.
G	Do.	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>Staphylococcus citreus</i> .	Loss of weight, pain in the appendix region and diarrhea (early morning).
V	Do.	H	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>S. hemolyticus</i>	History of dysentery and malaria, spleen and liver enlarged, loss of weight with diarrhea.
S	Do.	H	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Do.	Diagnosis as tabes mesenterica or chronic appendicitis.
N	Gram-negative bacilli.	Not tried.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>B. para-dysentericus</i> (Castellani).	See below.
X	Short chains ..	N	+	+	+	+	+	+	+	+	+	+	+	+	+	+	<i>S. faecalis</i>	Do.

+ = Acidity in the media.
N = Non-hemolytic.

mercury is predominantly used in the form of sulphides. It is indeed strange that a country where this metal was first harnessed into the service of medicine, should have chosen an insoluble and possibly an inert salt for therapeutic uses. We therefore thought it worth while to investigate whether this salt is rendered at all soluble under ordinary physiological conditions in the gut, and whether the mercury ion liberated from this so-called inert combination can be utilised by the tissues.

Experimental.—Ghosh (1931) has recently shown that the sulphides of mercury in a fine state of division undergo solution in 5 c.cm. of a 0.3 per cent. solution of HCl at 100°F. in an hour. This is also true when these sulphides are digested with filtered gastric juice obtained artificially from a healthy patient. If sulphide of mercury is broken up in this manner by the acid of the gastric juice, it is likely that absorption will take place. By feeding a young dog with finely powdered 'makaradhwaja' once a day for three consecutive days, he has further shown the presence of mercury in the liver. From these observations, he concludes that the insoluble sulphides are changed into soluble chlorides by the action of the gastric juice and in this form mercury is absorbed into the system *via* the portal circulation and stored up in the liver and other organs. This observation is based on only one animal experiment and cannot therefore be considered to be a definite proof of the absorption of the metal. In order to confirm the findings, we studied the absorption of the drug from the stomach and intestines by the following methods. The abdominal cavity of guinea-pigs was opened under ether anaesthesia in the epigastric or iliac regions as required, and sterilised catgut ligatures were placed at the pylorus in three animals and at the ileo-caecal junction in two others. A window was made into the wall of the stomach and finely powdered 'makaradhwaja' suspended in honey was introduced directly into the cavity, through the wound. The wounds in the stomach and abdomen were sutured and the animals allowed to recover from the anaesthesia. After this operation, the animals generally died within 24 to 30 hours. *Post-mortem*, the small intestines and the colon were ligated separately and their contents examined for the presence of mercury. Under ordinary circumstances, if the insoluble sulphide of mercury is converted into the soluble chloride and is absorbed into the system as suggested by Dr. Ghosh, we would get some evidence of the presence of mercury either in the liver, where it would have been stored, or in the colon washings, where it would have been excreted. As nothing has been allowed to pass through the pylorus in the first series of three animals and through the ileo-caecal valve in the other two, the presence of mercury in the colon would be a fairly reliable indication of its

absorption and circulation in the blood. In all the guinea-pigs where 'makaradhwaja' was introduced into the stomach in the manner described above, we could not detect the metal in any of the washings from the intestinal tract, neither was there any definite indication of its storage in the liver, at least in sufficient amounts to be distinguishable by the ordinary chemical tests for mercury. From these experiments, it may be said that mercury in the form of 'makaradhwaja' is not absorbed either from the stomach or the small intestines. It is, however, likely that very minute quantities are absorbed and excreted, and the ordinary chemical tests are not sensitive enough to detect its presence. Further investigations with improved methods of identification of mercury are therefore called for.

Excretion of the drug was next studied as the rate of elimination is a very good index of the rate of absorption and presence of a drug in the blood and tissues. 'Makaradhwaja' was obtained from reliable sources as most of the preparations in the market are said to be adulterated. It was administered to several healthy patients in doses of 1 to 2 grains (65 to 130 mgm.), following strictly the directions of the Ayurvedic practitioners. The drug was thoroughly rubbed in a stone mortar for about 15 minutes before administration to convert it into a fine, impalpable glossy powder and was mixed with pure honey as a vehicle. It was given daily for one week. After the first three days, samples of the urine were collected daily and examined according to the methods to be described later. Individual samples as well as samples from 24-hour collections (kept with toluene to prevent decomposition) were examined. Most of the volunteers were our laboratory assistants who were healthy young men and were under strict control.

In such a study, the excretion of the metal in both the urine and faeces has to be considered. Most of the analytical methods of estimation of the metal in vogue contain inherent faults, and any conclusions drawn as a result of estimation by these methods are likely to be fallacious. Booth, Schreiber and Zurick (1926) have described a new analytical method which has been claimed to yield accurate results and permits of the estimation of 5 mgm. or less of mercury in a litre of the solution in presence of organic matter. In principle, it consists of the oxidation of the excreta by digestion with sulphuric acid and potassium permanganate, precipitation of the mercury as sulphide and enmeshment of the precipitate by gelatinous manganic hydroxide. The washed and dried precipitate is ground up with lead chromate and decomposed by heating in a glass tube at 550°C. for 3 hours. The volatilized metallic mercury is condensed in the cooled portion of the tube. When the entire mercury has been separated, it is collected into one globule,

transferred to a calibrated capillary tube, the length of the column measured micrometrically and transposed to the corresponding weight. As this method entails the selection of cases who have to be kept under strict hospital supervision for the purpose of collection of the daily excreta for weeks, we tried to estimate the mercury excreted in the urine as a preliminary measure. The following method which is a slight modification of the original Bardach method was used:

To 250 c.cm. of well shaken unfiltered urine, 5 gms. of aluminium sulphate and ammonia were added. The mixture was then heated and filtered while hot. The precipitate was washed with hot water and dissolved in concentrated HCl. A bright clear copper foil was introduced into the solution which was set upon a water bath for 45 minutes. The amalgamated copper foil was removed, washed with distilled water and then with alcohol and finally with ether and dried in the air. A minute particle of iodine was introduced into a test tube and the copper roll was put in and gently heated. A yellowish or reddish deposit indicates mercury. This test is quite sensitive and allows the detection of as little as 0.01 mg. of mercury in a solution.

In seven healthy individuals experimented upon no traces of mercury could be detected in the urine by this method. The stools in some of these cases are being examined but the results are not yet conclusive. Further observations on these lines are being conducted with administration of 'makaradhwaja' for 2, 3 and 4 weeks and the results will be reported in due course.

Therapeutic uses.—'Makaradhwaja' is commonly used as a tonic in debilitating conditions and in convalescent patients after acute illness. In failing circulation and in cardiac asthenia, 'makaradhwaja' is considered to be a sovereign remedy.

Recent work has shown that the mercury ion in a high state of dilution has a definite stimulant action on animal tissues. A 1 in 1,000,000 strength of mercuric chloride added to the perfusate distinctly stimulated the isolated mammalian heart and increased its force of contraction. It is therefore likely that if absorption does take place in very small quantities, 'makaradhwaja' might produce a stimulant action on the heart. In view of this work, the senior author tried this drug in a few myocardial disorders following acute specific fevers. That there was distinct clinical improvement in the condition of individual patients after the administration of the drug for a period of 15 to 20 days there seemed little doubt, but extended trials are necessary before a definite opinion can be given. Mercury preparations have been used for many years as tonics and alteratives in Western medicine. There seems to be very good reason for such uses as it has been shown that small doses of

mercury diminish the amount of oxidation of the tissues, as evidenced by the variations in the gaseous interchange. Further, the administration of small doses of mercury to rabbits, dogs and men causes an increase in the number of red blood corpuscles, while the body gains in weight and the general nutrition is improved. Larger doses, however, have been found to act in the reverse way by causing a diminution in the amount of hæmoglobin, and the number of corpuscles, and in the weight. Most of the preparations of mercury in use in the British Pharmacopœia are rapidly absorbed, so that larger quantities of mercury ion than are good for the system are probably taken up. It is quite possible that in 'makaradhwaja' we have an insoluble preparation, which by action of the gastro-intestinal juices is rendered absorbable to such an extent that minute quantities of mercury ions sufficient for stimulation of the tissues and no more, are taken into the system and are acting on the tissues.

'Makaradhwaja' is also used as a laxative with good results, particularly in those cases when there is visceroptosis and an atonic condition of the gastro-intestinal tract. As an intestinal antiseptic also, it is said to be of great utility and is supposed to relieve the gaseous distension of the bowels due to fermentation. How far this is true has yet to be investigated, but mercury is known to be a powerful and readily diffusible protoplasmic poison, which acts in very high dilutions against lower forms of life. Recent researches on the intestinal antiseptics have shown that calomel is one of the few drugs which produces alteration in the intestinal flora and brings about an appreciable decrease in the bacterial contents of the gut. In view of these facts it is not unlikely that the claims made for 'makaradhwaja' in this connection may be borne out by further research.

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RABIES IN THE MONGOOSE

(REPORTS FROM RECORDS, INCLUDING A REPORT ON THE FIRST POSITIVE BRAIN OF MONGOOSE EXAMINED AT KASALI. COMMENTS INCLUDING SPECULATION AND BEARING ON TREATMENT.)

By S. D. S. GREVAL, B.Sc. (Punjab), M.D., Ch.B.,
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MAJOR, I.M.S.

Officiating Director, Pasteur Institute of India, Kasauli

I. Reports from records including a report on the first positive brain of mongoose examined at Kasauli.

1. Case No. 2877 of 1932

H. S., aged 60, male, of K. K., district Ludhiana. Bitten on 29th April, 1932. Came for treatment on 1st May, 1932. Finished treatment on 14th May, 1932. He stated:—

'I was watering my oxen in the animal shed when a mongoose rushed in amongst them. I lifted it up and

threw it away. I had hardly turned my back when it rushed back again, bit me behind and under the knee and held on. I removed the animal and squeezed the wound with the result that bleeding occurred and covered an area about the size of two pice. The blood was washed with water'.

(Translated from Punjabi by S. D. S. G.).

On examination four freshly formed small scabs, enclosing an area about 3—4 inch in diameter, were seen. No caustics or antiseptics had been applied. There was no sepsis. The patient was a tall and well built subject.

The mongoose, probably a male, had been killed and thrown away.

The bite was classed as *moderately severe* (class III, *Hempt*) and treated accordingly.

2. Copy of a letter received with the specimen No. 136 of 1932

'Sir,

I am sending you for examination the brain of a suspected mongoose. This mongoose has bitten a girl badly. I suspect it must have been suffering from rabies as it would not stop attacking even when beaten off. At last it was killed. Please inform me by wire if the girl must be sent to Kasauli for treatment.

B., district Jullundur.

G.S.

3rd May, 1932.

V. A. S.'

(Translated from Urdu by S. D. S. G.).

Sections from the brain, which was sent in spirit, showed Negri bodies of various sizes. This specimen was the first positive specimen examined at Kasauli. The girl never turned up for treatment, presumably due to the pressure of work in the village at the time of the harvest. The animal, as was ascertained later, was a male.

3. Copy of a letter from M. O. H., C. B. M., dated 9th May, 1932

'Dear Sir,

Yesterday afternoon I received a case from Meerut with the following history:—

A boy, aged 4½, was bitten on his bare* buttocks by a mongoose. The mongoose attacked several other persons who escaped being actually bitten. The mongoose had been living in the compound of the house for a long time* and the father of the boy had noticed that the mongoose,* a few days previous to this incident,* had begun to grow thin. After the incident the mongoose was caught and placed in a cage and died the next day.

As the wounds are superficial I have commenced the usual class II treatment. The question is whether this case should be continued as an ordinary class II.

I shall be much obliged if you would advise me in this matter, as I am not sure whether a mongoose is one of those animals which are* capable of suffering from* rabies'.

Later, the patient was brought to Kasauli for treatment (Case No. 3298 of 1932) and the following additional facts were ascertained:—

There were two mongooses living in the hedge round the compound of the house. They were almost tame and used to come into the house for food. Latterly only one mongoose was left. It attacked people in the house unprovoked but was frightened off by the adults. The patient, a child, was bitten without provocation. When the mongoose was caught it was discovered that it had broken its teeth and was bleeding from the mouth. Presumably it had been fighting and had killed its companion.

The teeth marks and the scratches had all healed without leaving scars. Only one long scratch, presumably caused by a tooth (it was found where the head

of the animal had been during the attack) had looked red. Iodine had been applied almost immediately.

This case was also classed as *moderately severe* (class III, *Hempt*).

4. Case No. 3387 of 1932

S. R., aged 25, male, of M. near Thanesar, district Karnal. Bitten on 16th May, 1932. Came for treatment on 24th May, 1932. Finished treatment on 6th June, 1932. He stated:—

'I was repairing the fence of my millet crop (the millet is grown out of season for the cattle when grass is scarce) when I saw a long and fat mongoose, at a distance of about 10 yards, uttering sounds of cur-cur-cur. The next moment it attacked me and climbing up my leg bit me on the thigh, through clothing, and held on. I detached it and threw it away. It then made for a well about half a furlong away. Men were bathing there and it created a stir amongst them. My cousin killed it and we buried it. The wound looked red though no blood flowed from it.

Mongoose abound in my village. When provoked they often attack people specially children but are easily frightened off. I was surprised at the behaviour of this mongoose.

The animal was presumably a male (large size and no teats)'.

(Translated from Hindi by S. D. S. G.).

On examination the site of the bite showed two linear scars about ½ inch apart. No antiseptics or caustics had been applied. There was no sepsis. This patient too was a tall and well built subject.

This case was also classed as *moderately severe* (class III, *Hempt*) and treated accordingly.

5. From the annual report of the Institute for the year 1929, part 2, page 4

'The second case was reported from Delhi and the following are the brief notes on the case as reported to us:—

"Mrs. B. P. (Indian), aged 35, was bitten on the left great toe by a mongoose, possibly rabid, on 21st September, 1929. The wound was dressed and healed up within 3 or 4 days leaving a small scar.

On 31st October, 1929, the patient fell ill and complained of pain in the left leg.

2nd November, 1929.—Pain in the left leg from pelvis to foot; feeling of anæsthesia; pain in uterus.

3rd November, 1929.—Pain over cardiac region. Itching in big toe (left). Feeling of constriction in throat. No temperature. Spasm of jaw; and unable to drink water. Restlessness; no sleep; fits all night.

4th November, 1929.—Fits ceased at 8 a.m., perspiration; death 12 noon".

The patient had not received any antirabic treatment. The case appears to have been undoubtedly one of hydrophobia and is reported since it is the first death to be recorded at Kasauli in a patient bitten by a mongoose'.

6. A table showing mongoose bite cases and mongoose brain examinations at Kasauli during the last 10 years, from 1922 to 1931

Year	Cases	Brain examinations
1922	4	0
1923	4	0
1924	4	0
1925	7	0
1926	0	0
1927	10	0
1928	0	0
1929	3	2 Negative
1930	0	0
1931	0	0

TOTAL .. 32

2

During the same period:—

Total number of cases treated.
67,326

Total number of brains examined.
4,708

* Indicates a correction by S. D. S. G. of a clerical error.

7. Identification of the mongoose

There is no record of the identification of the animal in the Pasteur Institute, Kasauli. According to the *Fauna of British India* 'the only generic type within the Indian area is *Herpestis*, the various subdivisions such as *Urva*, *Tamias*, etc., raised to generic rank by Hodgson, Gray and others, not being distinguished by characters of more than specific importance'.

II. Comments including speculation

Does rabies come into civilization from the wooded wilderness?

McKendrick in the *Tropical Diseases Bulletin* for September 1931, quotes U. Toit's summary to the effect that the yellow mongoose of South Africa (*Cynictus penicillata*) has been proved to be the sole transmitter of rabies in that country at the present moment. The conclusion drawn, however, is that 'apparently the infection has become somewhat modified during its sojourn in the wild carnivore'. Could one not reverse the picture?

Burma, where forests abound, has more than its fair share of rabies. In Arabia, where forests do not exist, one never hears of a death from rabies: such was my experience as a Specialist in Prevention of Diseases to the Aden Brigade for over four years: and such is the experience of the Civil Surgeon, Aden, who writes:—

'I have not seen nor heard of a single case of rabies in Aden and the surrounding districts. I have been in Aden, now, for three and a half years.

From the information obtained from reliable and intelligent persons jackals are to be found in the interior of Southern Arabia. As regards wolves, foxes and mongooses nobody seems to know if they are at all to be found in this part of Arabia'. (From a letter received on 30th May, 1932, Receipt No. 5422 of 1932).

Often one gets a history from patients, concerning their own rabid dogs, to the effect that their dogs never left the house unaccompanied and were never bitten by a stray dog. Could they not, then, have been bitten by a rabid mongoose in a bush in the compound of the house? In the localities where rabies occurs both in the dog and in the mongoose, a rabid dog biting a healthy mongoose, and letting it go to develop rabies later, is only a possibility, while a rabid mongoose biting a healthy dog, which will develop rabies later, is a reasonable likelihood.

Again, one occasionally hears of human cases dying from rabies, diagnosed by experts, with no history of a bite or even a lick from a stray dog. I heard of one such case at Rangoon. The victim, a son of a well-to-do Burmese family, kept rabbits as a hobby. Was he ever bitten by a mongoose?

Popular belief, in the Punjab at any rate, attributes rabies in the dog to a bite from a wild carnivore, a female jackal with young ones (*phonhin*) being specially incriminated.

A very strong argument against this hypothesis is the fact that rabies in a country can be stamped out by legislation against dogs.

Like the production and the use of fire which in ancient India was procured from a forest and then kept going in the village, could the genesis of rabies in the wild carnivores be one thing and its very rapid spread in the humanised carnivores another? Possibly the strong instinct of mutual distrust in the wild carnivores and the unsuspecting sociability of the humanised carnivores are responsible for the seeming state of affairs and the usual belief held. Or there may be some other biological factor at work making the disease smoulder in the forests and flare up in the populated areas. Aetiology in medicine is a very small fraction of ecology in biology.

III. Bearing on treatment

A mongoose, though a carnivore and possessing the carnivorous dentition and inclinations, has smaller and finer teeth than a dog or cat. The bite will draw blood and yet not look like a bite one is accustomed to see in an antirabic clinic. Besides, the bites appear to heal without any apparent sepsis. Within a few days all evidence of damage to the skin may disappear. In my opinion all cases of mongoose bite, when the animal has shown zeal and energy in inflicting the bite, should be treated, at least, as moderately severe (class III, Hempt).

Summary

1. Three new cases of mongoose bite have been described. One positive mongoose's brain has been reported. Attention is drawn to a death presumably from mongoose bite in an untreated case. All mongoose bite cases treated and mongoose brains examined at Kasauli during the last 10 years, from 1922 to 1931, are tabulated.

2. The possibility of rabies coming into the domestic carnivora from the wild carnivora is discussed.

3. The suggestion is made to the effect that a mongoose bite should be treated as a serious bite.

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A Mirror of Hospital Practice

AN ADVANCED CASE OF RICKETS TREATED BY OSSIN

By D. S. GHADIALLI, M.B., B.S.

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A FEMALE Bori child, aged 5 years, was admitted on the 10th April, 1931, for the treatment of deformities of both the lower limbs.

On examination she was found to be a case of very advanced rickety genu-valgum with marked anterior bowing of both the femurs, that on the right side being almost a semi-circle.

Her father could not tell when exactly the trouble started, but the deformity became easily noticeable about two years back. She presented an extreme bow picture of rickets. The

X-Ray appearance of the long bones

1. Marked rickety appearance at the bony ends.
2. Thinning and decalcified condition of the compact bone.
3. Peculiar opaque strands running regularly across the medullary cavity and dividing the latter as it were into so many spaces, the

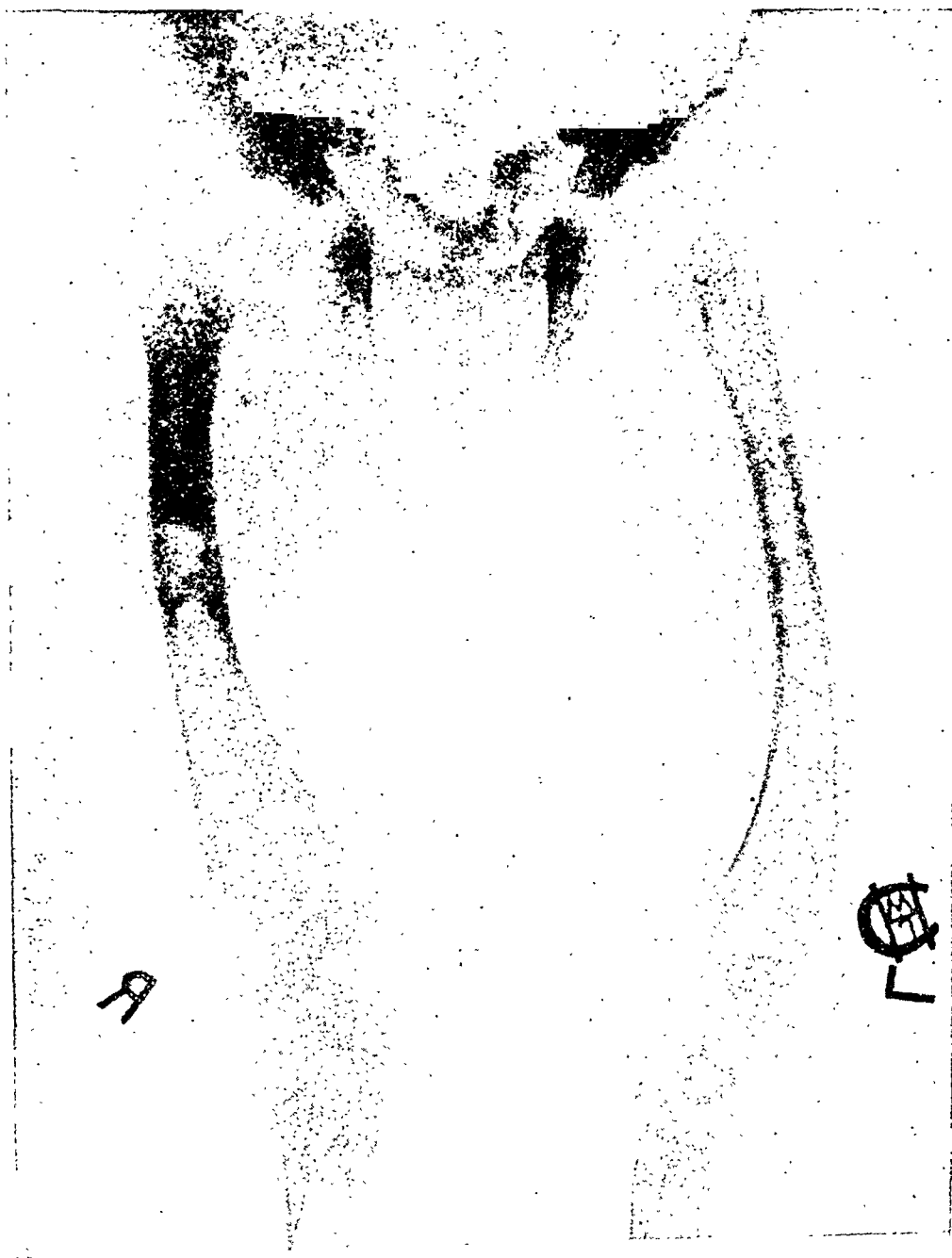


Fig. 1.—Before treatment.

disease had so crippled the child that she was not able even to crawl properly; she was apathetic and cross, and liked to be left alone in her bed. Her weight on admission was 25 pounds. When x-rayed the bones gave the following appearance (see figure 1):—

skiagram simulating an early condition of fibrocystic disease of the bone.

This condition is well marked in the femur only.

Through the kindness of Mr. R. M. Jassawalla who put the samples of Ossin freely at

our disposal, we were able to try on this child this new preparation, with a view to evaluating the extent of its usefulness in the treatment of rickets. In the early stage of our treatment, as we did not know the value of Ossin we subjected the child to a small dose of ultra-violet radiation in the hope that the latter

27½ pounds. When x-rayed again the following changes were observed (figure 2):—

1. Definite improvement at the epiphysis,
2. Calcification and thickening of the compact bone, and
3. Gradual disappearance of those peculiar opaque strands.

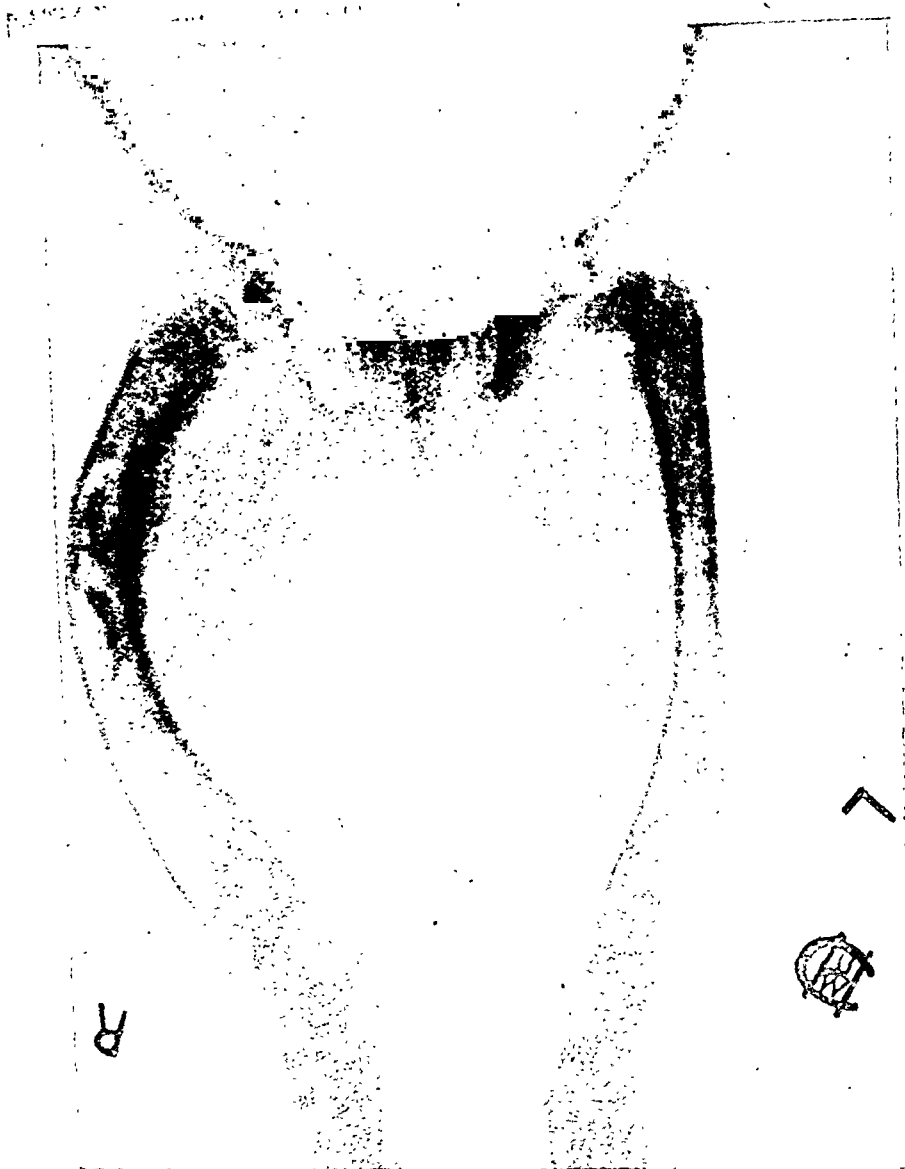


Fig. 2.—Six weeks later—improvement.

might put the child on the path of progress, so that we might be able to adjudge later on as to how far Ossin was maintaining or accelerating the progress initiated by the ultra-violet radiation.

Six weeks of treatment brought about a remarkable change in the general outlook of the child. She was no longer grumpy. She had become sweet, happy and cheerful. She could walk a little, if aided, although of course with great difficulty, and could only with difficulty be kept in bed. The weight had increased to

A month later the child was deemed sufficiently improved to allow of operative interference and the following operations were performed to correct deformities of the femur.

1. Cuneiform osteotomy of the right femur at the apex of the curve.
2. Linear osteotomy of the left femur at the usual place.

Convalescence from operation was uneventful.

The condition of the legs 2 months later is shown in figure 3.

The result of the operation was perfect. Weight $27\frac{1}{4}$ pounds. The condition of the bones was by no means satisfactory. It is noteworthy that the growing cartilages (epiphysial lines) have narrowed down. The calcification of the bones was, however, poor. The opaque strands observed in the medullary cavity still persisted. The shadow of the callus was very faint, showing poor calcification in that part.

to $27\frac{1}{2}$ pounds. The condition of the bones will be observed in figure 4, where the following changes will be noticed :—

1. Increasing calcification.
2. Shadow of the callus more opaque.
3. Considerable narrowing of the epiphysial lines.

From the above observations it may be noted that the case has been under our treatment for $6\frac{1}{2}$ months. In all, so far, about 55 ounces



Fig. 3.—After treatment.

General condition of the child was otherwise quite all right. No intercurrent illness has occurred that could be said to have retarded progress. It was decided now to couple Ossin with Dr. Stroschein's 'Thiokalz' (calcium thiosulphate).

One month later, the general condition was the same, the weight increasing by $\frac{1}{4}$ pound, i.e.,

of Ossin have been administered to the child. Also 7 injections of Thiokalz were given during the last month, the quantity injected being gradually increased from 2 c.cm. to 4 c.cm.

Considering the extremely advanced condition of the disease, the improvement is very considerable. The progress though slow has been very consistently maintained. Ossin

appears to contain all the essential vitamins. It may be noted that the child has not improved much in weight. This is however to be attributed to the effect that the child has all along been confined to bed, and being most of the time kept in plaster extending from the lower chest to his toes of both feet.

My grand-daughter, aged 7 years, during the last week of October 1931 was suddenly taken ill with fever and sore throat, the temperature in two hours' time reaching 101°F .; the tongue was coated with a thin white fur. A diaphoretic mixture, administered three-hourly, failed to lower the temperature. Twenty-four hours after the onset of the fever the skin from head to foot became hyperemic and erythematous, with close-set papules, the patient looking as red as a 'boiled lobster'.



Fig. 4.—Final condition.

Ossin is very palatable, children taking it readily.

A CASE OF SCARLET FEVER

By C. G. DHANDHUKIA
Bhavnagar, Kathiawar

As scarlet fever is seldom seen amongst Indians, and as the disease does not spread in an epidemic form in India, I think the following case is worth recording:

The tonsils were enlarged and the breath was foul. The temperature during the eruptive stage of the rash went up still further to 105°F ., and the patient became slightly delirious. It was now a typical case of scarlet fever though the source of the infection could not be imagined. Ice-bags were applied to the head and sodium salicylate in a diaphoretic mixture was given four-hourly.

On the third day of the illness the temperature was 104°F ., the tongue was red, the fur on it had disappeared, the breath was foul, the stools were offensive and the tonsils remained enlarged. The mixture containing sodium salicylate had the effect of reducing the temperature by, at the most, two degrees and this effect did

not last any longer than four hours after the administration of each dose; this necessitated its being given at regular intervals. This state continued till the sixth day when the rash began to fade and the temperature showed a gradual decline reaching only 103°F . in the evening. On the seventh day the temperature in the evening only reached 102°F . and application of cold to the head was no longer necessary. There was much irritation in the skin and the surface of the body was therefore frequently sponged with water. On the eighth day the temperature was 101°F ., on the ninth 100°F ., and on the tenth day of the illness it came down to normal and the patient was convalescent. Throughout this period the patient was fed with either plain orange juice, cooled with a little ice, or with orange juice with an equal quantity of milk, similarly cooled. Four or five days later the epidermis began to peel off and this process lasted for about a month during which time big flakes of the epidermis could be removed from the palms of the hands and soles of feet. Internal medication during convalescence was not necessary, but the body was anointed daily with sterilized oil half an hour before her bath; this process rendered desquamation easy and shortened the period of desquamation considerably.

During the eruptive stage the child lived in the same room as her younger brother and a still younger sister, and during the stage of desquamation she also played about with children in the street and yet none of her associates caught the infection, nor was any other case of scarlet fever seen in this town—Gadhada Swaminarayan, which has a population of about 5,500 inhabitants. Being the medical officer in charge of the State dispensary, I could not have failed to see them if any had occurred.

The points of special interest are that this was a typical severe case of scarlet fever, the patient was an Indian living in the plains in India, and the case was a sporadic one, that is to say, the source of infection was not traced and, although the child was not isolated, no secondary cases were reported.

A CASE OF RHINOSPORIDIUM POLYPUS IN A HINDU WOMAN

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S. India

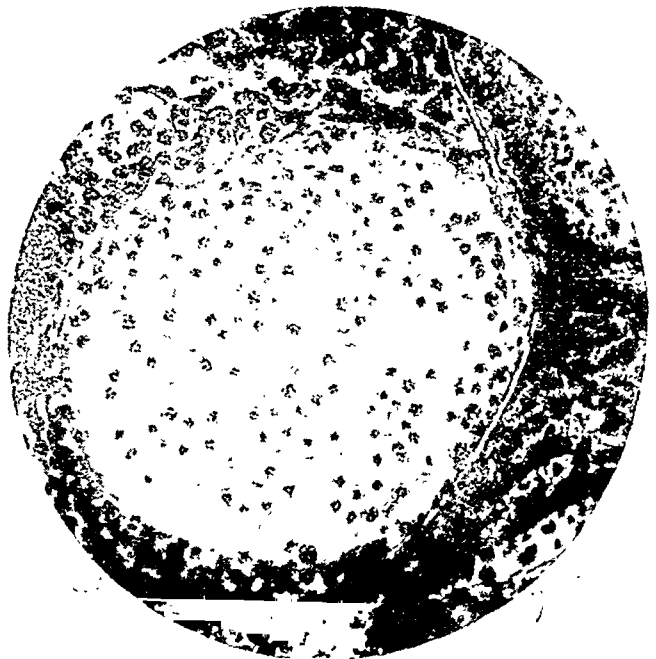
HAVING read the report by Dr. P. K. Kurup in the May number last year of the *Indian Medical Gazette* of the first case of *Rhinosporidium* infection described in the female, I asked the co-operation of our Indian staff in looking out for cases here. The first case of *Rhinosporidium* infection in a female was apparently that reported by Drs. P. V. Cherian and A. Vasudevan of Madras in the *Journal of Otolaryngology* in 1930. We have had only a few cases of nasal polypus, and practically all of them obviously of the ordinary type. On March 8th, however, they showed me a suspicious case. The patient was unwilling to have the growth removed but

we secured a portion of it sufficient for diagnosis. She was a Hindu woman, aged about 25, of low caste and coming from a village outside Madura.

The tumour was visible a short distance inside the nostril. It appeared irregular, but no white spots were seen. After removal it was found to have clefts in it, and resembled a papilloma; sections showed typical sporangia.



Section of the nasal growth.
No. 4 ocular. 1/6th objective.



The same as above, magnified.
No. 4 ocular. 1/12th objective.

The paraffin block was forwarded to Lieutenant-Colonel R. Knowles, I.M.S., Professor of Protozoology, School of Tropical Medicine, Calcutta, to whom I am much indebted for the photomicrographs published herewith.

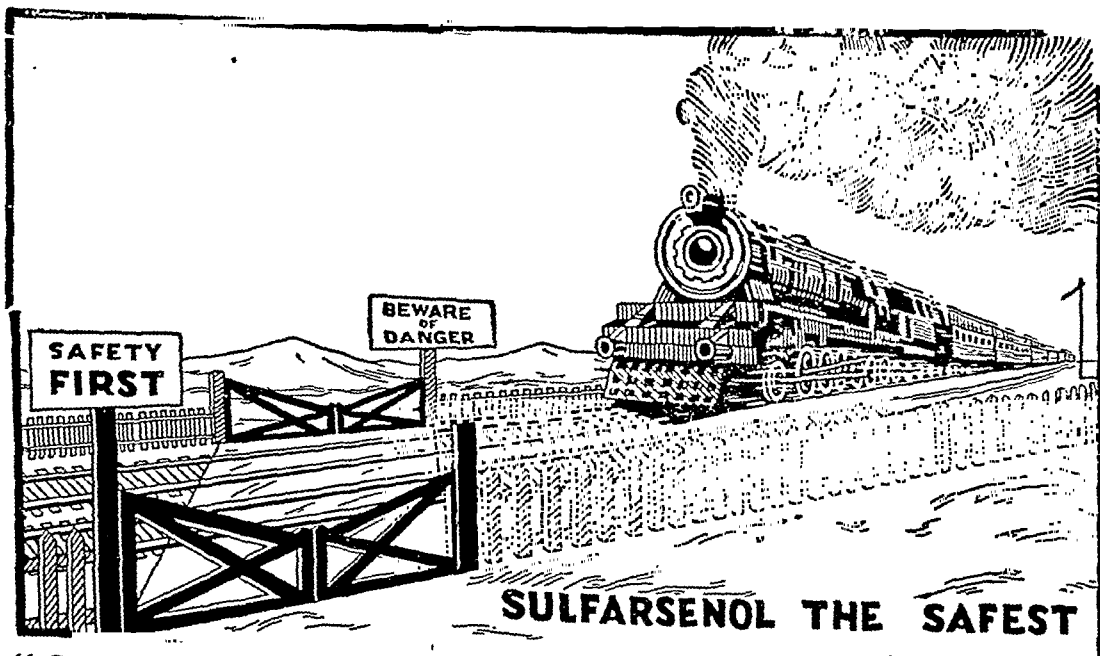
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Indian Medical Gazette

AUGUST

THE TROPICAL ANÆMIA OF PREGNANCY

On p. 421 of this issue we publish a paper by Dr. N. Gupta of the Pathology Department of the Medical College Hospitals, Calcutta, on 'the anæmia of pregnancy'. Dr. Gupta's paper completes a recent series of publications on this mysterious disease, and differs from that of former contributors in that, as pathologist to the Eden Hospital, Calcutta, he has had unique opportunities for studying the morbid histology of the disease. We may therefore take this opportunity of attempting to summarise this recent work as briefly as we can. The chief papers referred to are those by Dr. Luey Wills and her collaborators (Wills and Mehta, 1930, 1930a, 1930b, and Wills and Talpade, 1930); Dr. Margaret Balfour's paper of 1927, that by Major McSwiney in the same year, Dr. Subodh Mitra's paper of 1931, and Dr. N. Gupta's paper in our present issue. When taken together these papers form a series which convey a very considerable amount of information.

Nomenclature

The first point about this disease is its nomenclature. Writers refer to it either as 'the anæmia of pregnancy' or the 'pernicious anæmia of pregnancy'. Neither title is quite accurate.

Secondary anæmia, due to such causes as ancylostomiasis, malaria, kala-azar, leukæmia, or hæmorrhage, is common enough in pregnant women in the tropics; but the disease which we are considering does not fall under this head. In the series of 66 cases given by Wills and Mehta (1930) such causes were definitely excluded in 16, leaving a residue of 50 'idiopathic' cases. In McSwiney's series of 43 cases seen in two and a half years at the Eden Hospital, Calcutta, all such causes were ruled out. In Balfour's series of 150 cases studied in Bombay, malaria was found present in 8.7 per cent. as against a general figure ranging from 0.9 to 7.7 per cent. for the general population of Bombay; no dysenteric stools were seen, and hookworm ova only in one case. In Dr. Subodh Mitra's series of 86 cases in Calcutta, malaria parasites were detected only in one patient, *E. histolytica* in only one, and hookworm ova in only one; four cases gave a

positive Wassermann reaction, but in two of these the reaction was only weakly positive. Further, the blood picture and the course of the disease differ completely from those of secondary anæmia.

Nor is the disease identical with pernicious anæmia of Addisonian type. It affects younger patients, and is of shorter duration, there is an absence of marked remissions and exacerbations, it is specially associated with pregnancy and usually terminates with delivery, there is no achlorhydria but the reverse, the blood picture is different from that of true pernicious anæmia, as also is the response to liver treatment. As far as one can tell, the pregnancy anæmia with which we are dealing is a disease or symptom-complex *sui generis*, differing from other severe anæmias in many of its details.

The disease is essentially one associated with pregnancy, and usually with the later months of pregnancy. The patient, if she survives delivery, usually recovers slowly during the puerperium and afterwards. Wills and Mehta (1930) record having seen five non-pregnant women in Bombay showing exactly the same clinical and pathological picture; whilst Mackie (1929) goes so far as to suggest that there is a peculiarly fatal type of anæmia which has been long prevalent in Bombay, is not confined to pregnant women nor to sprue patients, is found amongst males and non-pregnant women, is met with in all classes of the community, and is found in most other parts of India when special enquiries have been made to elicit its presence. He considers that pregnancy and sprue are not specific factors in the causation of this anæmia, but some other cause is at work, and the disease is precipitated by conditions of undue physiological stress. He gives details of nine cases—all males, all poverty stricken and recently subjected to great hardship or privation. The disease is an aplastic anæmia, often megalocytic in type, and it can be distinguished both clinically and hæmatologically from Addison's disease.

Even if Mackie's most interesting suggestion is right, however, as met with in clinical practice this anæmia is especially associated with the later months of pregnancy.

The distribution of the disease is most peculiar in that it is apparently extremely common in the tropics, and only very exceptionally occurs in the temperate zones. Mitra (1931) gives a good summary of the earlier European literature on the disease. It was apparently first described by Walter Channing in New England in 1842, later in 1854 by Lebet of Switzerland as 'puerperal chlorosis'. Esch in 1917 collected 20 cases from the German literature of the previous twenty years. Bardy in 1924 published notes on 68 cases collected from the medical literature of Europe and the

United States over a period of 38 years. The following figures for Europe may be quoted :—

	Total maternity cases	Cases of grave anæmia
Vienna Maternity Clinic, 1891—1920 ..	90,000	8
Rotunda Hospital, Dublin, 1921—23 ..	12,000	1
Queen Charlotte's Hospital, London, 1923 ..	1,800	1
Simpson Memorial Hospital, Edinburgh, 1923 ..	1,600	0

If we add these together we get an incidence of 10 cases in 105,400 pregnancies, or less than one per ten thousand.

In India the figures are totally different. Balfour, as the result of sending a questionnaire round the chief maternity hospitals in India in 1925, received reports of 426 cases, of which however, details of pathological examinations were only available for 150 cases seen at the Bombay hospitals between October 1925 and April 1927. McSwiney gives details of 43 cases seen in a total of 2,544 maternity cases at the Eden Hospital, Calcutta, during two and a half years. Modi (1928) mentions having seen 4 cases in a year's practice in Baroda State. Banerji (1931) mentions a case in a Mahomedan lady of good family in Allahabad. Wills and Mehta (1930) record 66 cases seen at the Cama and Albless and Wadia Hospitals in Bombay between October 1928 and March 1929. Ghosal (1927) reports having seen about one hundred cases during twenty-five years' practice in the Bengal *mofussil*. Mitra (1931) gives details of 86 cases seen out of 1,883 labours at the Seva Sadan Women's Hospital in Calcutta between 1926 and 1930. Gupta (1932) bases his analysis on 203 cases seen at the Eden Hospital, Calcutta, between August 1928 and July 1930. If we add McSwiney and Mitra's figures together we get an incidence of 129 cases in 4,427 pregnancies, or 29.3 per 1,000—almost three hundred times the figure for Europe.

It would be interesting to know whether the disease is more prevalent in India in urban districts than in the countryside, but figures are lacking. Wills and Mehta mention having received a report from Accra on the Gold Coast saying that the disease is quite common there. In all probability, as with so many other tropical diseases, the disease is very common in the tropics, but occurs very rarely in the temperate zones.

For these reasons, we suggest the term 'the tropical anæmia of pregnancy' as emphasising the two most characteristic features of the disease.

Seasonal incidence

There appears to be considerable evidence that the disease is more prevalent during the latter half of the year. Thus Balfour gives the following table :—

Comparison of monthly incidence of anæmia of pregnancy with monthly births during 1926

Month	Births	Percentage	Anæmia, percentage
January ..	1,809	8.58	10
February ..	1,534	7.28	7
March ..	1,561	7.40	13
April ..	1,620	7.68	5
May ..	1,639	7.77	2
June ..	1,474	6.99	1
July ..	1,624	7.70	5
August ..	1,790	8.49	6
September ..	1,849	8.77	10
October ..	2,158	10.24	9
November ..	2,012	9.55	14
December ..	1,998	9.48	18

Closer examination shows that the seasonal incidence of the anæmia depends principally on the diarrhœic cases. 'During the year 1926, of 40 non-diarrhœic cases, 18 were in the first half and 22 in the second half of the year. Of 44 diarrhœic cases, 11 were in the first half and 33 in the second half of the year. There is evidently some factor in the second half of the year which favours the onset of diarrhœa'.

Wills and Mehta (1930) state that the disease appears to be seasonal in Bombay, most of the cases occurring between October and March. They quote Bartlett who noted in Pennsylvania that true pernicious anæmia had a quite definite incidence in the spring and summer.

McSwiney (1927) and Mitra (1931) give actual figures. These add up as follows—based on 129 cases studied in Calcutta.

Month	Cases	Percentage of total	Quarter	Cases	Percentage of total
Jan.	7	5.4	} Jan., Feb., Mar.	13	10.1
Feb.	4	3.1			
Mar.	2	1.5			
Apl.	5	3.9	} Apl., May, June	18	14.0
May	3	2.3			
June	10	7.7			
July	13	10.1	} July, Aug., Sept.	40	31.0
Aug.	9	7.0			
Sept.	18	14.0			
Oct.	15	11.6	} Oct., Nov., Dec.	58	44.9
Nov.	17	13.2			
Dec.	26	20.2			

The differences shown here are very striking. Mitra states that of 38 diarrhœic cases in his series, there were 12 in the first half, and 26 in the second half of the year. He adds 'It is a known fact that most of the toxæmias of pregnancy occur during the second half of the year. There may be some factors in this part of the year which favour the production of toxins in the body'.

Race and caste incidence

All authors are agreed that the disease affects all races and castes of the community (though no one appears to have yet encountered a case in a pure European in India). McSwiney gives the following figures for his 43 cases :—

Anglo-Indians 11, Jews 2, Hindus 26, Mahomedans 2, and Indian Christians 2.

This does little more than reflect the relative proportion in which these different communities come to a maternity hospital in Calcutta; on the other hand the figure for Anglo-Indians seems unduly high.

Balfour gives the following figures for her 150 cases:—

Hindus 59, Mahommedans 52, Indian Christians 29, Jews 7, and Parsis 3.

Here in Bombay the high incidence in Mahommedan women of the poorer classes is very marked (as also is that of eclampsia and osteomalacia). The disease however is not confined to those living in bad hygienic surroundings, but the lives of all were more or less confined and inactive. Very few cases are seen amongst the industrial workers who have to walk to and from their work. A spot map of the distribution of cases in Bombay showed that ward B had double the ratio of any other ward in the city; this ward is where most of the Mahommedans live.

Mitra notes that 79 of his cases were Hindus and 7 Mahommedans—of whom 5 died. The work of this hospital however is almost entirely among the Hindu population.

Gupta says that the disease occurs in all communities, both in villages and towns. Hindus, Mahommedans and Indian Christians are chiefly affected. Anglo-Indians and Jews suffer less in proportion, as well as in the severity of the disease, than do other communities. He gives the following interesting figures:—

Community	Maternity admissions	Anæmia cases	Percentage to admissions
Europeans	73	0	0
Anglo-Indians	1,022	8	0.8
Indian Christians	244	55	22.5
Hindus	1,304	116	8.9
Mahommedans	110	21	19.1
Jews	68	3	4.4

This table brings out clearly the high incidence among Mahommedans and the even higher incidence among Indian Christians. The latter class in Calcutta are often very poor, inadequately nourished, and live in unhygienic surroundings.

Age incidence

All writers are agreed that the disease affects younger rather than older women. Gupta states that it occurs chiefly at 15 to 20 years of age. We may add up the figures given separately by McSwiney, Balfour and Mitra; on doing this we obtain the following age distribution for 279 cases seen in Bombay and Calcutta:—

Age period	Cases seen	Percentage of total cases
15—19 years	29	10.4
20—29 "	180	64.5
30—39 "	56	20.1
40—45 "	14	5.0

These figures may not perhaps differ very much from the normal incidence of pregnancy

at the different age periods concerned, but they show that 75 per cent. of cases of tropical anæmia of pregnancy occur in patients under 30 years of age.

Parity incidence

McSwiney gives tabulated figures. He notes further that twins occurred in 3 out of his 43 patients, an incidence of 6.97 per cent., or more than five times the normal incidence of twins. Multiple pregnancy may possibly be a pre-disposing cause. Both McSwiney and other writers lay stress on the frequency with which the anæmia may recur in subsequent pregnancies; a patient may recover from the first attack in the first pregnancy, only to die from the disease in her second pregnancy. Patients should be warned of the danger of becoming pregnant again. Mitra notes that 66 out of his 86 cases—or 77 per cent.—were multiparæ. Gupta on the other hand states that the disease chiefly affects primiparæ.

We may add together the figures given by McSwiney and Balfour. On doing this we obtain the following parity distribution for a total of 193 cases:—

Parity	Number of cases	Percentage of total cases
1-paræ	59	31.0
2-paræ	41	22.7
3-paræ	27	13.9
4-paræ	14	7.2
5-paræ	16	8.2
6-paræ	8	4.1
Over 6-paræ	25	12.9

These figures again may not perhaps differ much from the normal incidence of parity among an Indian female population of child-bearing age, but it seems noteworthy that more than 53 per cent. of cases occur during the first or second pregnancies.

Onset of the disease

The accounts given by different writers differ slightly with regard to the mode of onset of the disease. All are agreed that it is a disease of the later months of pregnancy rather than of early pregnancy. McSwiney notes that there is a special tendency, not towards abortion, but towards miscarriage. Balfour states that the disease is usually of sudden onset in previously healthy women between the 5th and 7th month of pregnancy—this occurred in more than half the cases studied. Sixteen gave a history of bad health throughout the pregnancy; 6 gave a history of similar symptoms in previous pregnancies; 75 began with fever; 58 with marked diarrhœa; 17 with œdema and increasing weakness. Pyrexia was noted in 125 cases out of 150, or 83 per cent.—and was especially common on the second or third day after delivery. The prostration is not as great as would have been expected from the degree of anæmia present.

Modi (1928) notes that his four cases were all young females, aged about 20, of well-to-do

of less than one million, 114 between one and two million, and 53 with a count between two and three million; the average for the whole series being 1.53 million. The average colour index was 1.1, and the average leucocyte count 7,485 per c.mm. Anisocytosis, poikilocytosis and polychromatophilia were present in 74 per cent. of cases, 20 per cent. showed punctate basophilia, 25 per cent. normoblasts or pre-normoblasts, and only 0.4 per cent. true megaloblasts. There was a tendency in the differential leucocyte count to an increase in the neutrophiles.

As a control to the above series of figures we may give Mitra's figures for a series of 55 pregnant Bengali women not suffering from anaemia, but of hospital class. These gave an average red cell count of 3 million, haemoglobin 55 per cent., colour index 0.9, average leucocyte count 7,000 per c.mm., with an average reticulocyte count of 1 per cent.

It will be seen that the severity of the anaemia is sufficient to account for the high mortality rate associated with this disease.

Other laboratory findings

The Wassermann and Kahn tests.—McSwiney lays special stress on the incidence of syphilis in his series. The Wassermann test was definitely positive in 8 out of 20 patients examined, and doubtful in another two. Where a positive Wassermann test results, anti-syphilitic treatment should be pushed, for its results are excellent.

Other writers tend rather to regard syphilis as a cause of secondary anaemia in pregnancy, but not as a cause of the special tropical anaemia of pregnancy. Balfour applied the Kahn test in 32 cases; of these 15 gave a positive and 17 a negative finding. Wills and Mehta exclude cases with a positive Kahn reaction as not being true cases of the disease in question. In Mitra's series 11 cases were examined by the Wassermann test; 2 gave a strongly positive and 2 a weakly positive result. In Gupta's series 8.5 per cent. of patients gave a positive Wassermann reaction.

On the whole, one cannot say that the incidence of syphilis in these series is above the normal figure. It does not appear to be a true factor in the production of the tropical anaemia of pregnancy. The great rarity of the disease in Europe is further evidence in favour of this view.

Blood culture.—The only author apparently who has carried out blood cultures is Balfour. Out of 13 cases, 11 yielded sterile cultures, one a non-haemolytic streptococcus, and one a Gram-negative bacillus. There is no evidence here of a blood infection.

Gastric juice cultures were carried out by Wills and Mehta. They write 'The resting gastric juice was also cultured, but neither streptococci nor gut organisms were ever recovered, except in one case from which a streptococcus was given similar to one obtained from the very septic gums. As nearly all the cases had free acid in their resting juice, these results are not unexpected'.

Urine cultures.—The view has been put forward that this (and other severe tropical anaemias) may result from faecal organisms—especially haemolytic streptococci—invading the blood stream from a slightly ulcerated or abnormal gut; such organisms being excreted especially in the urine. Accordingly several authors have paid special attention to this possibility.

Balfour gives the following figures for culture of the urine in 150 cases:—

Sterile	37 cases
<i>B. alkaligenes</i>	23 "
<i>B. pyocyaneus</i>	18 "
Streptococci	7 "
Staphylococci	5 "
Coliform organisms	32 "
Gram-negative organisms (not identified further)	28 "

Culture of the urine in 41 control cases of normal pregnancy gave:—

Sterile	32 cases
<i>B. alkaligenes</i>	6 "
<i>B. aerogenes</i>	1 case
Gram-negative organisms	2 cases

On this evidence she is inclined to support the gut-blood-invasion theory. Unfortunately she omits to state whether the cultures were taken before or after delivery—an extremely important point, as urinary cultures taken after delivery are extremely susceptible to contamination.

The same possible source of fallacy applies to the figures given by Emanuelov and Mehta (1927). They give the following findings—

Urinary cultures from 73 cases of pregnancy anaemia gave—

Sterile	18
Streptococci	24 (4 out of 21 tested were haemolytic).

Other organisms 34

Urinary cultures from 59 normal controls gave—

Sterile	54
Other organisms	5

They comment on the fact that bacterial organisms were isolated from the urine in 79.5 per cent. of cases of pregnancy anaemia, as compared to only 8.4 per cent. in normal controls. Unfortunately they do not state whether the urinary cultures were taken before or after delivery.

Wills and Mehta recognise the importance of this point, and hence their figures are of much greater value. Twenty-eight cases were examined before delivery; the urine was sterile in 25, grew *B. coli* in 2, and a non-haemolytic streptococcus in 1 instance. In the urine of 11 cases examined after delivery haemolytic streptococci were found in 2, non-haemolytic streptococci in 4, a diphtheroid organism in 1 and *B. coli* in 1. All but one of the infected cases were suffering from severe diarrhoea. With regard to Balfour's findings they remark that 'the fact that a large number of the cases occurred in one lying-in hospital suggests the possibility of an epidemic of puerperal sepsis'. They are opposed to the gut-blood-invasion theory.

Mitra writes 'In about 50 per cent. of cases culture (of the urine) gave positive results; the organisms commonly found were streptococci, but a few *B. coli* were present'. Again, he fails to differentiate between results before and after delivery. Gupta states that colon bacteria were found in some 50 per cent. of his post-natal cases, and that faecal streptococci were also common in these cases. The ante-natal urine, however, was practically always sterile.

The summary of evidence on this matter, we may conclude, is definitely against the view that the disease is due to invasion of the blood stream by haemolytic organisms from the gut, though perhaps further work on ante-natal cases is wanted.

The faecal flora.—There has been a good deal of work carried out on the possible connection of the *Bacillus welchii* (*aerogenes capsulatus*) to pernicious anaemia, some workers claiming that absorption of the toxins from this organism in the gut causes the anaemia, others definitely stating that there is no relationship between the two. Consequently considerable attention has been paid to the possible relationship between *B. welchii* and the tropical anaemia of pregnancy.

Balfour found *B. welchii* in unusually large numbers in the stools of 2 out of 4 cases examined.

Emanuelov and Mehta (1927) carried out fairly extensive studies on the point:—

45 cases of pregnancy anaemia showed the presence of *B. welchii* in 42, and its absence in 3.

31 normal controls gave *B. welchii* present in 28, absent in 3. Both series yielded both haemolytic and non-haemolytic strains of the organism. On injection cultures did not prove pathogenic to laboratory animals, but proved pathogenic to the unborn young, of whom all but one died within a fortnight of birth. Injection of toxins filtered from the cultures in some cases led

to chronic anaemia and death, especially when repeated doses were given. In all cases where pregnant guinea-pigs were inoculated, the young were still-born or died within three days of birth.

On the whole it cannot be said that this work proves any causal connection between *B. welchii* and the tropical anaemia of pregnancy.

Wills and Mehta write as follows:—'Emanuelov and Mehta in previous work from this laboratory failed to establish the aetiological significance of the presence of either *B. welchii* or streptococci in the stools and urine of these cases. In animal experiments with both organisms the typical blood changes were not produced, and the presence of such organisms in the stools even in large numbers has been shown by Davidson in his work on the intestinal flora of pernicious anaemia to have no direct relationship to the disease. In the present studies, the stools from a small series of cases were fully investigated in Colonel Acton's laboratory at Calcutta. The stools were plated with special reference to the presence of streptococci, but though numerous organisms, many pathogenic, were isolated, in only one case was a streptococcus isolated.

Gupta considers that an increase in the general bacterial content of the gut may be associated with the onset of the disease. He found *B. welchii* in 2 out of 10 stools examined.

On the whole the evidence in favour of the disease originating from some specific infection in the gut is very weak.

Biochemical studies.—Wills and Mehta (1930) are the only workers to record biochemical studies in the disease.

The van den Bergh reaction was tested in a series of cases. The figures obtained showed, in contrast to the findings in true pernicious anaemia, that the indirect van den Bergh reaction is not increased but falls within normal limits. A high indirect van den Bergh reaction should suggest undiagnosed malaria or syphilis.

The blood chemistry was studied in another series of cases, with normal controls and a second control series of untreated osteomalacia cases. The authors write as follows:—'If the figures from the series with blood counts under one million are excluded, there is no significant difference between the non-protein nitrogen values obtained in the control and in the anaemic cases. In the extreme anaemias there is a slight increase in the total non-protein nitrogen which is largely accounted for by the increase in urea, so that the ratio is increased above normal, unlike the ratio from the toxæmias of pregnancy which is decreased. The chloride figures from the anaemic series are increased proportionately to the degree of anaemia, i.e., to the increase in plasma volume. The findings suggest that in the anaemic series cases occur that are definitely low in both calcium and inorganic phosphorus, presumably due to a lack of vitamin D, as in the osteomalacia cases'.

Test meals were examined in 24 cases, with 6 non-pregnant controls. The figures clearly establish that achlorhydria, far from being constantly present as in true pernicious anaemia, is very rarely present in the condition under consideration. In one non-pregnant and three pregnant cases no free acid was found, but as the mineral chlorides were above 40 per cent. in all cases, the achlorhydria was of a different order to that found in true pernicious anaemia where the chloride values do not exceed 30 to 35 per cent. The range of acidity and chloride values is similar to that found in any series of hospital patients.

Morbid anatomy and histopathology

Owing to caste prejudices, very few observers have obtained post-mortem examinations. Balfour records two, Mitra four, and Gupta obtained several—of which he gives details of four by way of illustration.

Balfour notes that at post-mortem all the organs are very pale. The liver and spleen give a marked Prussian blue reaction, owing to the presence of hæmosiderin in abundance. The spleen shows effete red corpuscles undergoing destruction, and a quantity of deep golden-brown pigment scattered throughout it.

Large areas of the bone marrow are aplastic and nucleated cells few in number. Large megaloblastic cells and some eosinophile myelocytes were seen.

Mitra notes that the liver is large, very pale, and friable. There is fatty degeneration of the central part of the lobules, accompanied by extravasation of blood, whereas the peripheral part of the lobule looks quite healthy. He considers this evidence of the toxæmic character of the disease and compares it with the similar appearances found in hyperemesis gravidarum and acute yellow atrophy. The hæmosiderin is deposited in the periphery of the lobules and in the Kupffer cells. There is undue activity of the reticulo-endothelial system in the peripheral area as evidenced by erythrophagocytosis. In the spleen proliferation of the reticulo-endothelial system is very marked, but no degenerative process was found on histological examination. The bone marrow (tibia) showed extremely marked aplastic changes, red marrow being present only in the epiphysial boundary; otherwise the whole field is full of yellow marrow. Haematopoietic changes are present and include the presence of megaloblasts. In the kidneys there was very slight degeneration and the reticulo-endothelial proliferation is not very marked.

Gupta gives a somewhat different picture. The liver is enlarged, appears fatty and brownish-red in appearance. Histologically the most striking feature is the abundant hæmosiderin scattered as ferric dust in the liver cells themselves. It is rare for any secondary anaemia to show such extensive pigmentation. Accumulations of erythroblastic cells and foci of myeloid hyperplasia are also met with in the capillaries, as well as in the liver substance itself. In some areas the red corpuscles are phagocytosed by the Kupffer cells. Interlobular hæmorrhages and central fatty degeneration are marked.

The spleen also is full of hæmosiderin. Histologically, myeloid metaplasia and haematopoietic changes are conspicuous features, whilst there is marked reticulo-endothelial proliferation. Small groups of myelocytes and nucleated red cells are seen both inside and outside the venules. Debris of red cells are seen within the protoplasm of the large phagocytic cells which are increased in number.

The kidneys look swollen and pale, and on section the cut surface bulges out. The cells of the tubules are enlarged and in some areas may contain droplets of hyaline material. Epithelial casts may be formed in some areas. A large amount of hæmosiderin pigment in the form of fine granules is seen in the cells of the excreting tubules, but the glomeruli are more or less free from these granules.

The cortical cells of the suprarenals appear to be vacuolated, and the medulla is narrowed. Hæmosiderin is present underneath the capsule. Hæmosiderin is also seen in the thyroid gland in the connective tissue, in the glandular structure and in the colloid secretion.

In the bone marrow general activity of all varieties of cells is the predominating picture. Non-granular mononuclear cells and myelocytes are greatly in excess. The number of fat cells is greatly reduced and their place is taken by foci of different types of cells. Phagocytosis of the red cells is observed, but the whole picture, so far from being of aplastic type, is one indicating hyperplasia.

The histological changes are in keeping with the tremendous destruction of hæmoglobin which occurs in the disease, resulting in the deposition of hæmosiderin throughout the internal viscera.

Treatment

The whole question of treatment turns upon the fact that if the mother survives delivery, the prognosis is fairly good. Hence the question of terminating the pregnancy by artificial methods at once arises. Most authors appear to be content to await the normal and usually premature delivery; all are agreed that if labour

is to be induced only slow and gentle methods should be employed. McSwiney considers that more patients might be saved if this was resorted to.

In general, McSwiney advocates iron and arsenic, either orally or by injection; fresh air, good food, and plenty of sunshine. He considers that whole blood transfusions may prove very dangerous or even fatal. Intramuscular injections of whole blood, in doses of 15 to 20 c.cm. weekly, on the other hand, gave very good results.

In cases with a positive Wassermann reaction immediate anti-syphilitic treatment should be adopted.

Paterson, Field and Morgan (1930) in America strongly advocate transfusion of whole blood, and administration of liver extract. They treated three cases, and in one noted an increase in the reticuloocyte count from 3 to 37 per cent. when the patient was put on liver.

Wills and Mehta state that the response to liver treatment is good, but in post-partum cases the red cell counts and hæmoglobin values seldom reach figures that could be considered normal in a European woman. Liver treatment is far more successful after delivery than before it.

Mitra considers that no patient can be considered cured until the puerperium is well established. Intramuscular injections of whole blood often give very good results, but this measure is not an indispensable one. Deep x-ray therapy to the liver, spleen and over the ends of the long bones to stimulate the reticulo-endothelial system gave good results in 12 out of 16 cases in which it was tried. He considers that spontaneous termination of the pregnancy is safer than inducing labour.

Gupta considers that it is not so much a poor diet as an injudicious one that is often at fault. The diet should be studied and regulated. In patients seen within the first three months of pregnancy the uterus should be emptied, but these cases are very rare. Marmite is of special value in the disease. Intravenous whole blood transfusions usually set up premature labour, and should not be given. Repeated intramuscular injections of whole blood, however, are of value. It is better not to interrupt the pregnancy in the ordinary case, unless the degree of anæmia be very severe.

Galloway (1929) recommends ultra-violet light exposures at two-day intervals, with iron injections intramuscularly, if other treatment tried for a month has failed.

The ætiology of the disease

Several different views have been put forward as to the ætiology of this strange disease. We have already discussed most of the evidence in this connection, and here can only give the very briefest of summaries.

(i) That it is due to invasion of the blood stream by hæmolytic organisms from the gut. It is perhaps true that more investigation of this view is wanted, especially in pre-natal cases. Such bacteriological evidence as has been collected, however, is opposed to this view. The fact that the temperature returns to normal with treatment by liver extract alone does not support an infective theory.

(ii) That it is a toxæmia arising from absorption of toxins from the gut. Mitra stresses the fact that the histological picture in the internal viscera strongly supports this view. On the other hand, the blood pressure is low and not high. The few blood analyses do not support this view, as they do not show the changes characteristic of such a toxæmia. The blood chloride values show no reduction, but on the contrary a rise. In the most severe cases there is a slight increase in the non-protein nitrogen constituents, largely due to the raised urea values, but no more than could be expected in such a condition when the extreme anæmia would lead to some failure of kidney condition.

(iii) That it is a toxæmia arising from the products of conception. This view depends largely on the analogy with eclampsia. On the other hand Balfour remarks that in pregnancy anæmia the foetus never suffers from the same blood condition as the mother, and when it dies, it does so apparently from lack of nourishment. Wills and Mehta believe that the same disease may occur in non-pregnant women, and Mackie that it may occur in males.

(iv) That—to quote Wills and Mehta (1930)—‘the fundamental factor in the causation of this anæmia of pregnancy is chronic insufficiency in the diet of vitamins A and C’.

Wills and Mehta (1930) draw attention to the very general prevalence of a mild grade of anæmia among the women of Bombay; even in healthy pregnant women the red cell count very rarely exceeds 3 million per c.mm. A study of the diets of the cases of pregnancy anæmia showed a general deficiency of vitamins A and C, and this in spite of the very varied diets eaten in the different communities concerned. Even in Mahomedan households, where a large amount of ghee is taken, the ghee is usually badly adulterated. The frequent finding of low serum calcium and blood inorganic phosphate values in the non-purdah cases suggests that even in these cases there is an associated mild D deficiency, pointing to an inadequate fat intake.

Their early experiments on animals also strongly supported this view. A diet deficient in the same elements as those that were lacking in the diets studied in Bombay produced an extreme and fatal anæmia, the majority of the animals affected being pregnant, though a similar condition occurred less frequently and



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generally in a less severe form in non-pregnant animals.

Accordingly, Wills and Talpade (1930) carried out a hygienic and dietetic survey of women of child-bearing age in Bombay. The groups chosen were :—

- A. Healthy Hindu women of the middle and professional classes.
- B. Women of hospital class belonging to all communities, viz.—
 - (i) 70 healthy women recently delivered of healthy, living children.
 - (ii) 25 women recently delivered of premature children, but otherwise apparently healthy, the cause of premature delivery being unknown.
 - (iii) 20 Hindu mill workers.
 - (iv) 40 old cases of pernicious anæmia of pregnancy, discharged from hospital, and able to resume their ordinary avocations, chiefly housework.

Blood counts and hæmoglobin estimations were done, and details are given. Visits were paid to houses on five consecutive days, and the actual foodstuffs eaten weighed item by item and detailed particulars recorded. Group A served as standard controls. It was found in general that all groups in B, as compared with group A, showed dietaries which were under-caloried, relatively low in both total and animal protein, markedly deficient in both total and animal fat, and deficient in fresh fruit and vegetables. Consequently there is a marked deficiency in vitamins A and C and in salts. The conclusion was come to that it is this relative deficiency in vitamins A and C that causes the onset of the tropical anæmia of pregnancy.

Group B as a whole lived under grossly overcrowded housing conditions, especially the mill workers, but the latter get exercise in walking to and from their work.

The enquiry was now transferred to Coonoor, and the third paper—(Wills and Mehta, 1930a)—gives the normal blood standards for the Nutritional Laboratory's stock albino rat, a necessary preliminary to further work. Finally, Wills and Mehta (1930b) succeeded in producing a very severe anæmia in rats by feeding them on diets devised to be relatively deficient in vitamins A and C, the deficient diets used including both natural and synthetic diets. The anæmia was much more frequent and much more severe in female rats. Many of the animals made spontaneous recoveries. Examination of blood films showed that the anæmia was due to the presence of *Bartonella muris* in the red cells of the anæmic rats, and splenectomy demonstrated that all the Coonoor stock was infected with *Bartonella*. Liver and spleen feedings failed to protect the rats from this anæmia after splenectomy. Finally, the only animals in the experiments that developed an anæmia after the inoculation of *Bartonella*-infected blood were pregnant rats fed on the

so-called 'Bombay Hindu' diet—deficient in vitamins A and C.

This work gives very clear evidence in favour of the vitamins A and C deficiency theory (and incidentally points to the very grave necessity in Indian towns for enforcing legislation with regard to the quality of ghee, as ghee should be a most important source of vitamin A, but is frequently so adulterated that it contains little or none).

* * * * *

At this point, the official enquiry under the Indian Research Fund Association ceased. It is extremely unfortunate that the dire necessity for retrenchment has prevented the enquiry from being resumed. It is obvious from the statistics which we have quoted that the disease is of enormous importance in causing both maternal and infantile mortality in India. Further, it is a disease which especially affects India as compared with countries in the temperate zones, and it should therefore be especially studied in India. Lastly, a thorough study of this disease is likely to throw much light upon the causation of other severe anæmias in India, such as that associated with sprue. It is to be hoped that, if funds ever become available, the enquiry will be resumed.

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Medical News

INDIAN MEDICAL SERVICE ANNUAL DINNER

THE annual dinner of the Indian Medical Service took place at the Trocadero Restaurant on Wednesday night (June 15th) when Major-General J. W. D. Megaw, C.I.E., presided over a large and distinguished gathering of members of the Service. He was supported by Sir Samuel Hoare, M.P., Secretary of State for India, Major-General Sir Havelock Charles, G.C.V.O., Sir Leonard Rogers, K.C.S.I., F.R.S., and many other officers connected with the Indian Medical Service.

The Chairman, as Director-General of the Indian Medical Service, said he had been asked to propose the health of the Service and also of the guests, and he was rather puzzled at first as to why the toasts should be combined, but he would endeavour to do his best to propose the combined toast. He went on to say that he would begin by conveying to the gathering a message from the officers of the Indian Medical Service now serving in India, who sent cordial greetings to their brother officers at their General Annual Reunion. The message was signed by General Graham and on their behalf he would reply that they heartily reciprocated the good wishes of their fellow officers in India (Cheers), but he would like to assure them, if they had any anxiety as the length of his speech, seeing that he had to propose the combined toast, that he would endeavour to keep it as short as possible.

But there were some things that must be said. Firstly, he had to thank them for the great honour they had conferred upon him by asking him to preside; and, secondly, he had to welcome their distinguished guests and to convey their appreciation of the great honour they had conferred upon them. Especially, he had to thank their chief guest, The Rt. Hon. Sir Samuel Hoare, the Secretary of State for India, who had sacrificed his scanty leisure in order to be present on that occasion to cheer and encourage them. It was always said that gratitude is a lively anticipation of benefits to come. Even if they were human enough to think mostly of their own troubles they could assure him of their sincere sympathy in the very difficult and responsible task he had undertaken as the Representative of India in the Government, a position which he had eminent qualifications to fill. They recognised Sir Samuel as a 'fellow sportsman', and sportsmanship made a special appeal to members of the Indian Medical Service, who instinctively trusted sportsmen, and that trust is responsible for the rising stock of the Service when a slump might have been expected. On the contrary, they were getting excellent recruits; the last batch carried off all the prizes open to them at Millbank, which was a good omen for the future, and all the members in India were in good heart and good fettle and there was no tendency to write Ichabod.

Excellent relations between the European and Indian members of the Indian Medical Service, said the Chairman, continued and this was a credit to the young Indians and also to the European senior members who treated them as their younger brothers. The suggestion of some Indian politicians that the European members strove to maintain a medical monopoly in India was entirely unfounded. Evil motives attributed to those European members reminded him of a quotation from Gibbon, who—in his description of the Council of

Constance where John XXII was only accused of piracy and murder—said that the most scandalous charges were suppressed. (Laughter and Cheers). After all spiteful attacks should not discourage them; indeed they would rather feel anxious if they were not attacked. (Laughter and Cheers). But it is creditable to all that the members of the Indian Medical Service had progressed so smoothly hitherto. It was right that it should continue to do so, but it would be dangerous to force it unduly. He was also glad to remind them of the cordial relations which still continued with the R. A. M. C. and he desired to pay a tribute to Major-General Nickerson, V.C., who had secured the love and esteem of the members of the Indian Medical Service as if he were a member himself. They would desire to offer their congratulations to the members who had received esteem during the year—to mention only a few, Sir Leonard Rogers, Sir R. Needham, General Graham and Colonel Mackie. None of these had deflected an inch from the path of duty for the sake of ingratiating themselves with the powers-that-be. (Cheers). It would take up too much time to refer in detail to their records, but the discoveries of Sir Ronald Ross, Sir Leonard Rogers and Lieutenant-Colonel F. P. Mackie were of exceptional value.

The Chairman went on to say that something more important even than the preservation of the Indian Medical Service was at stake. There was no hope for India unless it had an efficient medical and public health organization. (Cheers). That was a sweeping statement, but he made it with a full sense of responsibility. Let them consider the nature of the problem—a huge population, well over three hundred millions, and rapidly increasing; engaged in a constant struggle for a precarious subsistence. Their task was to give these teeming millions a chance of securing a fair, rational and satisfactory existence, for whom they had made themselves responsible. Sir Samuel Hoare would be the first to agree that none of the proposals of party politicians in India could influence to any appreciable extent the great elemental forces now ruthlessly at work. The problem of India was essentially biological and not political. (Cheers). He claimed that the medical research workers' first duty was to make a clear statement of the real nature of the problem and of the proper method of providing a solution. He recognised that the medical and public health workers could not, however, deal with the situation themselves alone; they needed the co-operation of experts in agriculture, industry, economics, and education. It was as clear as noonday to all observers who are able to detach themselves from political ebullitions that India was rapidly reaching to a condition which would demand the united efforts of Indians and Europeans to deal with. When that time came it would be a matter of vital importance to India to have a supply of men of the kind that can only be provided by a strong All-India Medical Service. (Cheers).

And every member of the Indian Medical Service has been greatly encouraged by the promise that the British Government is going to keep in the letter and in the spirit the long contract that has been made with all the Indian Services. (Cheers). It would indeed be a black day for the Empire if the members of the Indian Services were thrown to the wolves who were already baring their teeth in an unmistakable manner. There were signs of a desire to throw up the sponge and regard the work of Britain in India as coming to an end. 'I do not', continued the Chairman, 'take that view'. (Loud Cheers). 'I am convinced that, whatever constitution is established in India, the great forces to which I have referred will continue in their remorseless march, so that, even if we desire to leave India to her fate, we shall be compelled to continue the work. Only the foundations of a prosperous India have been laid; the structure is far from being completed and is only now beginning to take shape. We older ones can envy the young men who are at the beginning of their career in India, they are embarking in a great adventure in

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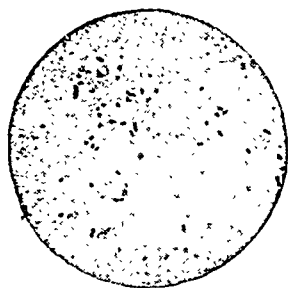


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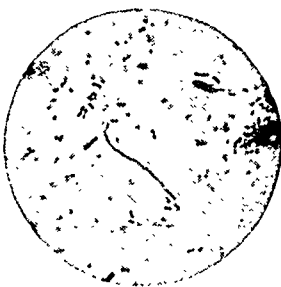
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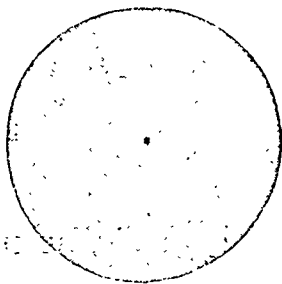
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which the Indian Medical Service will in the future play a greater part than it has ever done in the past. (Loud Cheers).

Sir Samuel Hoare in replying to the toast of the Indian Medical Service, which the Chairman had proposed, said he was proud to have had his name associated with such a toast, and to have it coupled with the names of the officers who are at work and with the officers who are on probation. (Cheers). So far as he was concerned and so far as the Government of which he was a Member was concerned, no constitutional changes which had been made will affect the pledges which we have entered into with you; whatever form the constitution of India may take, nothing would be done to disturb the great services which an organization like yours has been able to give. (Cheers). General Megaw had a reputation of being disinterested and very unselfish; he has always seen the best in other people. He has been very kind to me, said Sir Samuel, and I appreciate it in General Megaw, and I appreciate it in your great Service.

General Megaw's speech, continued Sir Samuel, had started two lines of thought; the first was that how hollow were the charges that they took more out of India than they gave back to it; and, secondly, how great were the benefits which the medical science of the Indian Medical Service was conferring upon the East. It was a complete answer to the hostile critics, who said that they were treating the Indian Medical Service as a monopoly of Europeans. What better answer could they give to India and the world than to point out the immense benefits which the Indian Medical Service had conferred upon that country and other Eastern Nations. The Indian Medical Service was an outward and visible sign of the falsity of these charges. They might have made such arrangements as would have kept that Service in their own hands, but the presence of many Indian officers of the Service on that occasion showed how baseless such a charge would be. They were delighted to have with them those Indians who shared with their British colleagues concentration upon the common effort to improve the standard of health in India.

The Indian Medical Service had been the pioneer of scientific work in the East since the days of Gabriel Boughton and John Howell, and their work was not confined to medical science alone. It had extended to botany, zoology, geology, veterinary science, forestry, philology, and other departments of human investigation. (Cheers). He was sure that when the history of the British connection in India was written it would prove beyond a possibility of doubt that the benefits they had been enabled to confer upon India had far outweighed any material advantages that they might have gained from the existence of the Indian Empire. (Cheers). What a romantic history was theirs; he thought of the great work their Chairman had done; he thought of the work of Sir Ronald Ross now lying dangerously ill and whom they all sincerely hoped might soon be restored to health. (Cheers). Every soldier behind his mosquito net might think of how the dangers of malaria and yellow fever had been minimised, if not altogether abolished through his discoveries. Then there was the work of Sir Leonard Rogers; for the first time in human history it had been possible to cure that terrible disease leprosy in its early stages, if the detection was made soon enough. Then there was cholera, the death-roll of which had been reduced from 50 per cent. to 20 per cent., and there were great hopes that that reduction would be continued. Then there was the danger from liver abscess, a disease to which Indians were especially liable. There were 97 deaths a year in the British Army from that disease up to 1907, which had now been reduced to nil. 'I think of the pioneers in the battle against kala-azar or black fever, that swept as a spreading epidemic between 1881 and 1900 up two hundred miles of the Assam Valley, with a case mortality of 96 per cent., and then reappeared in 1918 after the influenza epidemic with 80,000 cases. Now

90 per cent. of the cases are cured. (Cheers). It was now proved that, with sufficient organization, the disease can be stamped out in Bengal. These are the great achievements, not only of your Service, but of the British Empire as a whole. What other Empire can claim a record of this kind? Upon the one hand we have taken with us justice and peace and on the other we have carried health victoriously into the jungle of disease. (Loud Cheers). The achievements of the Indian Medical Service are written not only in history from the pen of Colonel Crawford, but also in the lives of the men, women and children, which they have saved. To-night I am here, as Secretary of State for India, to bear a tribute to this great record, and to ask you not to be discouraged by the uncertainty of the future. After all, the whole world at this moment is filled with uncertainty, which surrounds us on every hand. There was not a career—political, commercial, scientific, or medical—that was not surrounded on every hand with uncertainty, and I still hold to the firm conviction that work will still come to the top. Your work, so far from being finished, is only now beginning to enter upon a new and greater advance. These scientific and biological questions are going to be of much more importance in the future than ordinary political questions. I ask you not to throw in your hand, I ask you to go on constantly in the belief that inestimable as were the benefits your Service has conferred upon India in the past, it will bestow even more inestimable benefits in the future'. (Cheers).

Colonel Sir R. A. Needham, D.S.O., gave the health of the Chairman and said that his duties were somewhat awkward for him because he could not sing General Megaw's praises as Director-General of the Indian Medical Service in the presence of other officers, nor could he as a junior officer dwell upon his frailties. (Laughter and Cheers). They had on this occasion a real five active Director-General as their Chairman. He believed that their Chairman spends much time cogitating in an air-cooled laboratory. It would be a good thing if some of the hot-bloods who were anxious to suppress him could be subjected to the same treatment. (Laughter). And perhaps it would be a good thing if some of the gentlemen lately gathered round a certain Round Table could spend a few days in this air-cooled chamber. (Laughter). General Megaw is returning to India in a few days to resume his work there, and they would extend to him their loyal and unswerving support in the battle which he is fighting in India against disease. (Cheers). The Chairman in reply thanked Colonel Needham for the kind words he had said. The duty upon which he had been engaged had not been a very light and a very pleasant one, and all he could say was that he was returning to India to do his duty.

The officers present were:

Major-Generals:—Sir Havelock Charles, *Bart.*, G.C.V.O., K.C.S.I., H. Boulton, C.B., C.B.E., Sir Leonard Rogers, K.C.S.I., C.I.E., F.R.S., G. Tate, C.I.E.
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Majors:—C. H. P. Allen, R. S. Aspinall, Sir T. Carey Evans, M.C., S. N. Hayes, J. M. Hennessy, R. Lee, J. M. Mitchell, O.B.E., H. J. Symons, M.C.

Captains:—M. L. Ahuja, G. R. M. Apsey, K. M. Bharucha, Dev. Datt, T. J. Davidson, J. E. Gray, K. H. A. Gross, M.C., W. A. Khan, C. K. Lakshmanan, F. E. B. Manning, E. A. O'Connor, T. S. Riddle, A. Rosenblood, J. F. Shepherd, Pasuant Singh, A. Tait, R. K. Tandon.

Officers on Probation:—Captain J. H. Crawford, Captain W. Happer, Captain J. J. Quinlan, Captain R. A. Wesson, Lieutenant F. C. Jackson, Lieutenant H. Hannesson, Lieutenant W. A. N. Marrow, Lieutenant R. J. Ried, Lieutenant M. Sendak.

The guests were the Rt. Hon. Sir Samuel Hoare, Bart., G.B.E., C.M.G., M.P., Secretary of State for India, F. H. Brown, Esq., C.I.E., N. G. Horner, Esq., of the *British Medical Journal*, and E. C. Morland, Esq., of the *Lancet*.

Current Topics

The Amœbiasis Problem

By C. F. CRAIG, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. XCVIII, May 7th, 1932, p. 1615)

THE first essential in the consideration of the subject is a definition of the term 'amœbiasis'. By 'amœbiasis' I understand all infections of man with *Endamœba histolytica* without regard to the presence or absence of symptoms of such infection. In the past, the terms 'amœbiasis' and 'amœbic dysentery' have been regarded as synonymous by most writers of monographs and textbooks, and it is surprising to see in some of the most recent works, even those on tropical medicine, the entire subject of amœbiasis considered under the heading 'amœbic dysentery'. Such a conception of amœbiasis is obsolete and until the profession understands that amœbic dysentery is simply one stage of amœbiasis, little can be hoped for from the standpoint of prophylaxis and treatment. Despite all the data that have accumulated demonstrating that amœbiasis, including amœbic dysentery, is world-wide in distribution, the majority of the medical profession still considers amœbic dysentery a tropical disease and amœbiasis as synonymous with amœbic dysentery. As stated elsewhere, 'It is most unfortunate that the term "amœbic dysentery" should have become, in the minds of most medical men, a synonym of amœbiasis, or amœbic infection; for while dysenteric symptoms are quite characteristic of the serious cases of infection with *Endamœba histolytica*, the vast majority of such infections are not accompanied by dysenteric symptoms but by much milder symptoms usually attributed to some other factor and not recognized as the result of infection with this parasite'.

In order to demonstrate that amœbiasis is a public health problem, it is necessary, in addition to establishing its incidence, to show that *Endamœba histolytica* is a pathogenic parasite causing pathologic conditions in man and that in the infected individuals lesions and symptoms are produced which are caused by its presence.

So far as the available evidence of scientific value is concerned, there is no reason to believe that *Endamœba histolytica* lives and multiplies in the lumen of the intestine of man without some of the amœbas invading the tissues. I have stated elsewhere, and further experience has only confirmed my opinion, that *Endamœba*

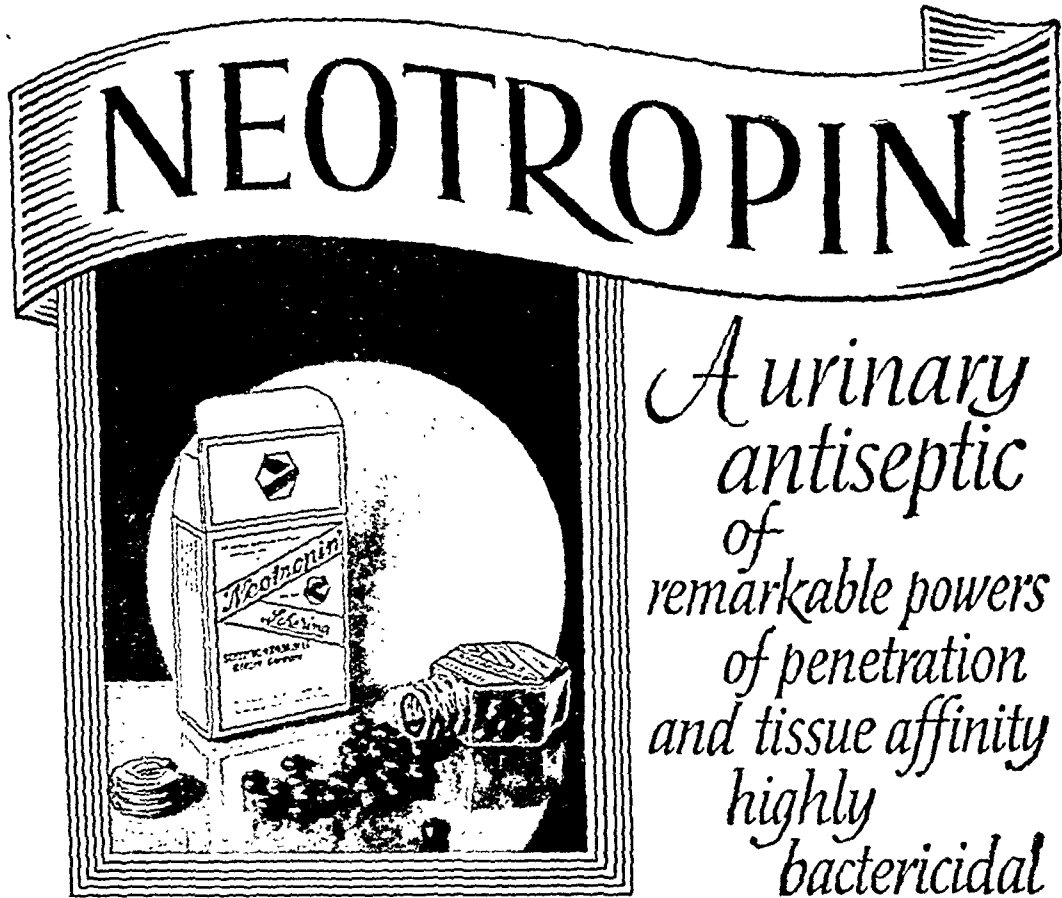
histolytica is essentially a tissue parasite and that there can be no infection with this parasite without the production of pathologic lesions, however minute such lesions may be. This organism undoubtedly cytolyses intestinal epithelium and by means of its amœboid motility penetrates the intestinal tissues, and it is illogical to believe that it will continue to live in the intestine for long periods of time without attacking the mucous membrane. Whether symptoms of the infection occur or not depends, in great measure, on the natural resistance of the individual. The great majority of 'carriers' of this parasite are so resistant that the minute lesions produced by it are healed almost as rapidly as they are produced and no symptoms develop, but if resistance is lowered by overwork, poor food, the enervating effect of a tropical climate, improper diet, repeated exposure to massive infections, or stress and strain of whatever cause, symptoms of diarrhœa or dysentery will develop after a variable period. It should also be remembered that the absence of symptoms does not prove that lesions have not been produced by the parasite, as will be noted later.

If the work on the experimental production of infection with *Endamœba histolytica* in susceptible animals is critically reviewed, it will be found that there is no evidence that this parasite can live for long periods in such animals without producing pathologic lesions. Even when no symptoms of the infection have been noted in such animals, an examination of the intestine after the animal has been killed has always shown some lesions caused by the parasite. Transient infections have been reported in animals in which the amœbas were present in the feces for a few days and in which no lesions were found in the bowel, but these infections cannot be considered as comparable with the carrier condition in a person in whom the organisms are found in the feces for weeks, months and even years.

Likewise it is true that there exists no evidence that *Endamœba histolytica* can live in the intestine of man without invading the mucous membrane and causing pathologic lesions. The absence of symptoms in the majority of carriers has been urged by those who believe that at times the parasite is harmless as proof of this belief, but it is well known that marked lesions due to its presence may exist without appreciable symptomatology.

In my own experience, I have seen seven cases of amœbic abscess of the liver, all originating in individuals who had never been out of the United States, and all in individuals who had never suffered from dysentery or repeated attacks of diarrhœa. It is needless to stress this point further except to state that those who believe that absence of symptoms proves the harmlessness of *Endamœba histolytica* in carriers of the parasite have no scientific basis for such a belief.

A considerable proportion of carriers of *Endamœba histolytica* do present symptoms of their infection. Just what this proportion is it is impossible to state, and it will certainly be found to vary greatly in different localities and among different peoples. In my own experience covering the past ten years, during which time I have paid special attention to the subject, I would say that approximately 30 to 50 per cent. of carriers of this parasite present symptoms. I base this conclusion on the history given by the patient, the demonstration of the parasite in the feces, and the disappearance of the symptoms after appropriate treatment succeeded in eliminating the amœbas. I cannot follow those who are so enthusiastic in their conception of the pathogenicity of this parasite that they believe there is a definite clinical picture associated with infection with *Endamœba histolytica* in carriers, but I do firmly believe that certain symptoms are frequently caused by it, connected with the gastro-intestinal and nervous systems. Space forbids their consideration at this time, but in previous contributions I have discussed the symptoms in detail. Those observed are in no way pathognomonic of the condition, as similar symptoms may occur in numerous disease conditions of the gastro-intestinal tract; but their occurrence should always



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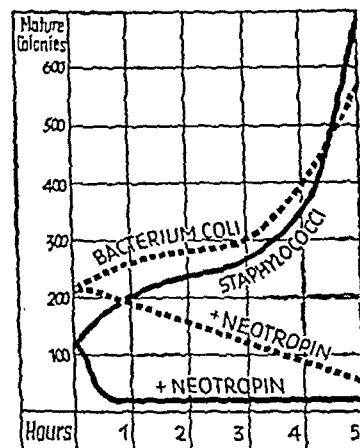
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lead to an examination of the faeces for *Endamæba histolytica* and proper treatment for the elimination of the parasite if it is found.

Some of those who have advocated the idea that *Endamæba histolytica* may be a harmless commensal in man believe that different strains of the organism differ in virulence and that some strains are avirulent. Here, again, all the evidence available is against such a supposition.

In 1913, Walker and Sellards demonstrated by actual experiments on human volunteers that the feeding of cysts of *Endamæba histolytica* from the faeces of healthy carriers of the parasite, who had never had symptoms of their infection, produced amebic dysentery in such volunteers, and Kessel's work with kittens demonstrated conclusively that the amebas from carriers were as pathogenic to these animals as those obtained from patients having amebic dysentery. In fifty-eight attempts to infect kittens with twenty strains of *Endamæba histolytica* from acute cases of amebic dysentery, thirty-five, or 60 per cent., were successful, while of 103 attempts to infect kittens with twenty different strains from carriers of this parasite, fifty, or 49 per cent., were successful. Spontaneous recovery sometimes occurred in both groups; the incubation periods were similar, and the length of life in the two groups in the fatal infections did not vary. This work has been confirmed by Dobell, who found that a strain of *Endamæba histolytica* isolated in cultures from a carrier with no symptoms of his infection was just as capable of causing lesions in kittens as a strain cultivated from a case of acute amebic dysentery. In the extensive experiments now being conducted by Faust in the Department of Tropical Medicine at Tulane University of Louisiana School of Medicine, on amebiasis in dogs, there has been no evidence that *Endamæba histolytica* from carriers of the infection is less virulent than from individuals presenting symptoms of the disease, and in a recent paper Faust states that 'there is no detectable difference in susceptibility (of the dog) to human strains of an acute, chronic or carrier type'.

The avirulent species of amebas practically indistinguishable from *Endamæba histolytica* described by Brumpt under the names *Entamæba dispar* and *Entamæba hartmanni*, confusion with which he believes explains the absence of symptoms in most carriers, are not accepted by English and American authorities, and I have seen nothing in my work on amebiasis which would lead me to believe that these so-called species of amebas exist. The experimental work of Walker and Sellards, Dobell, Kessel and Faust amply demonstrate that *Endamæba histolytica* in carriers is virulent both to man and to susceptible animals, and Kessel definitely states that amebas among the strains he used presented the morphology described by Brumpt as that of *Entamæba dispar*, and that kittens inoculated with such amebas developed the same dysenteric symptoms and showed the same pathologic changes as those inoculated with typical *Endamæba histolytica*.

It has been found by all who have studied the subject that individuals infected with *Endamæba histolytica* frequently enter hospitals or clinics for other conditions, or for the treatment of obscure gastro-intestinal symptomatology, and properly conducted surveys for this parasite in hospitals and clinics have invariably resulted in the discovery of numerous infections with this parasite which were hitherto unsuspected. It is impossible at this time to review the evidence that has accumulated which demonstrates beyond doubt that a considerable proportion of patients admitted to hospitals, and who consult gastro-enterologic clinics in this country, are suffering from infection with *Endamæba histolytica*; but that this is true is now recognized by all well informed physicians.

CONCLUSION

The importance of treatment of infections with *Endamæba histolytica*, even though there may be no symptoms present that have attracted the attention of

the infected individual, cannot be overstressed. No one can tell what pathologic lesions may be present in such individuals or what lesions may develop in the future. Every individual harbouring this parasite should be treated as soon as the diagnosis is made. Treatment is for the best interests not only of the patient but also of the public, as the cure of every infection reduces by that much the danger of the transmission of the parasite to others.

Anæsthesia, General

(Abstracted from the *Prescriber*, Vol. XXVI, April 1932, p. 119)

Basal narcosis.—The principle of basal narcosis (a term preferable to 'basal anæsthesia') is now much in favour. It is more than merely a preliminary to general anæsthesia, being an actual part of the anæsthetizing process. Given by rectum (avertin), or intravenously or even orally in some cases (barbiturates), while the patient is still in bed, it induces a narcosis which not only protects the patient from psychic shock, but admits of the use of a much smaller quantity of the subsequent general anæsthetic.

Several investigations are reported of the comparative value of certain basal narcotics. Barlow, Duncan, and Gledhill find the order of efficiency of four well-known substances to be: nembutal, avertin, phanodorn, pernocton. The margin of safety is greatest for avertin, but the shorter duration of narcosis to some extent offsets this advantage. A similar investigation by Kleindorfer and Halsey shows that avertin and amytal are safe and efficient; other barbiturates require further study before their safety can be demonstrated. Nembutal was not included in this investigation.

Clinical trials by Ferguson show that sodium amytal given orally is an excellent sedative preliminary to other and deeper anæsthesia. Avertin has the advantages of ease of induction, good relaxation, moderately prolonged sleep, and reduction of post-operative vomiting; it is contraindicated in shock and great debility, in disease of the liver or kidneys, and in disease of the rectum. Neither drug is in itself a reliable anæsthetic, but both offer advantages as basal narcotics preliminary to such anæsthesia as nitrous oxide. Sodium amytal is specially indicated in nervous patients, where only light narcosis is required and muscular relaxation is not essential; avertin with nitrous oxide gives greater relaxation but otherwise has a more limited field of usefulness.

Avertin.—The use of avertin or tribromethyl alcohol (tribromethanol) is on the increase, and the literature regarding it is now very voluminous. As its properties and the technique of its administration are now fairly well known, only a brief recapitulation is necessary. Avertin is a white powder and is given by rectum in aqueous solution. The dose is 0.05 to 0.1 gm. per kilo of body-weight (5½ to 6½ grains per 10 lb.), the required quantity being dissolved in water to make a 3 per cent. solution. The temperature of this solution must be maintained carefully at 35–40°C. (95–104°F.) and must on no account exceed the higher figure, as decomposition readily occurs, yielding acid products extremely irritating to the intestine. Freedom from acidity is indicated by addition of a few drops of Congo red solution. 'Fluid avertin' is issued for convenience in preparing the solution.

Among the clinical reports may be mentioned that of Goldschmidt and Hunt, who used avertin fluid in 314 basal narcoses. In only about 3.5 per cent. was no satisfactory action observed. In 24 per cent. full surgical anæsthesia was obtained; in 20 per cent. the basal narcosis was supplemented with local (procaine) analgesia; in the remainder some form of general anæsthetic was employed. In all cases the dose of the supplementary anæsthetic was much less than that usually required without basal narcosis. A striking effect was the complete amnesia observed in all patients, none of whom had any recollection of the events following the instillation of the avertin. The only contraindications found were parenchymatous liver damage and extensive bilateral kidney disease.

Desmarest has found nitrous oxide to be the most suitable general anæsthetic with which to supplement avertin. This gas has a blood-pressure-raising effect which counterbalances the lowering action of avertin. Wülfing uses 'rinarom', a mixture consisting of ether (12), chloroform (1), and ethyl chloride (2), with a balsamic perfume, which he administers from an Ombrédanne mask. This appliance causes a certain amount of carbon dioxide to be inhaled, which has a stimulant effect on the respiratory centre.

Owen records an interesting personal experience. Having previously been operated upon five times under different anæsthetics he dreaded a repetition. For his sixth operation (appendix and inguinal hernia) avertin was given at 7-40 a.m. This (he was afterwards told) was supplemented with a very small amount of ether. From a minute or two after administration of the avertin he knew nothing until he awoke at 5-30 p.m. as if from ordinary sleep. He soon fell asleep again and awoke at 8 p.m. thoroughly refreshed. He was then told that he had awoke at short intervals between 1-30 and 5-30, but of this he could remember nothing. The absence of all unpleasantness in 'going under', and the complete freedom from after-effects, lead him to describe avertin as an ideal anæsthetic.

Stander finds that avertin produces no change in the non-protein nitrogen, urea nitrogen, uric acid, lactic acid, creatinine, chlorides, and carbon dioxide combining power of the blood, and only a very slight increase in blood-sugar. Anoxæmia seems to play no appreciable part in the anæsthesia produced. Stander has used avertin with good effect in cardiac disease necessitating operative interruption of pregnancy. He has had no experience of its use in eclampsia, but thinks that before it is tried as a remedy for this condition its effect on the liver should be more thoroughly studied.

The use of avertin in gynaecology is further described by Young. He now reports on its use in over 1,000 cases. Avertin presents the advantages of comfort of induction and of reduction of post-operative distress, morbidity, and pulmonary complications. Its disadvantages are a lowering of blood-pressure, which is of no practical significance, and depression of respiration, which is harmless, and if severe can be readjusted by administration of carbon dioxide. The occasional after-headache may be relieved by a dose of 5 grains of amidopyrin. In doses not exceeding 0.1 gm. per kilo it is safe. In Young's 1,000 cases no deleterious effects were noticed, and the five deaths that occurred could not be attributed to the drug.

The use of avertin in neurological surgery is discussed by Dandy. The chief drawback of ether in intracranial operations lies in the swelling of the brain, and, this together with post-operative vomiting and pneumonia, is responsible for a high percentage of the mortality associated with operations on the brain. He has found avertin to be particularly useful in cerebellar approach for partial section of the sensory root in trigeminal tic douloureux, the absence of swelling of the brain making the operation very much simpler. The drop in blood-pressure is of no practical significance.

McQuillan has found avertin useful in goitre surgery. Using a dose sufficient to produce only light unconsciousness, and supplementing with gas and oxygen or ethylene-oxygen, he has had excellent results with no accidents. The patient must be watched carefully, especially after he has been returned to bed, as sagging of the jaw may happen with blocking of the upper respiratory tract by the tongue. Price regards avertin as the ideal anæsthetic for thyroid cases, in which it appears to work better than in any others. He has used it in about thirty cases, and all have done well. A preliminary dose of morphine, about twenty minutes before the avertin, is desirable. The anæsthetic he uses is gas and oxygen. Price thinks that chloroform is definitely contraindicated in combination with avertin.

One of the applications of avertin is as a sedative in delirium. Belfrage reports a case in which tracheotomy was necessary and urgent in a patient suffering from

delirium tremens. An enema of avertin quickly subdued the delirium and allowed the operation to be proceeded with. Unfortunately the patient died of suffocation from the obstruction (carcinoma of the larynx) before the tracheotomy was completed. Richet and Joly report six cases of alcoholic delirium complicating epilepsy, in which rapid improvement followed the use of avertin. Sleep supervened in a few minutes and lasted for about twenty-four hours, the patients awaking with complete lucidity.

Pharmacology of avertin.—The effect of avertin upon the circulation has been studied by Raginsky, Bourne, and Bruger. The results of their experiments show that avertin, in concentrations higher than are found in normal avertin anæsthesia, has no deleterious effect on the heart; in much greater concentrations it slows the heart, diminishes the peripheral output, and increases the coronary circulation. The peripheral circulation appears to be affected, but this is considered to be of little importance. Adrenalin in avertin narcosis frequently causes cardiac irregularity and in heart-lung preparations occasionally causes ventricular fibrillation.

The action of avertin on the liver has been further studied by several workers. Parsons experimented on rabbits by staining the liver for fat after varying doses of the drug, but interpretation of the findings was difficult because of the accumulation of glycogen which tended to mask any pathological changes. He was able to demonstrate slight fatty degeneration after doses of 0.5 gm. per kilo, but he does not regard these experiments as conclusive. Bourne and Raginsky report a fairly exhaustive study of its action on normal and impaired livers. They find that repeated administration in normal dogs produces only a mild parenchymatous degeneration of the liver and kidneys, and that fatty changes in the liver occur occasionally but when they do they are very slight. Avertin has by no means the same damaging effect upon the liver as has chloroform, and it can probably be used quite safely in persons with moderate liver damage though it is perhaps advisable to use a smaller dosage.

The effect of avertin upon the cerebrospinal fluid pressure is the subject of a report by Gardner and Lamb. These workers find that during narcosis by avertin (0.1 gm. per kilo) an increase occurs in the pressure of the cerebrospinal fluid of approximately 100 mm. of water. After a lapse of from fifteen to twenty-five minutes the pressure is approximately 50 mm. higher than the initial reading.

Raginsky and Bourne report an interesting investigation of the action of ephedrine in avertin narcosis. They describe experiments on dogs and observations on human patients which show that the narcosis produced by ordinary doses of avertin may be interrupted or considerably shortened by intravenous injection of one mg. of ephedrine sulphate. The pulse-rate increases, the blood-pressure rises, and the depth and duration of the narcosis is much lessened. In dogs a larger dose of ephedrine was used and some of the animals were completely awakened. This property of ephedrine is of value clinically in overcoming too profound narcosis by avertin.

The possibility of controlling the action of avertin by means of thyroxine was referred to in the *Prescriber's* review two years ago, when the observations of Pribram were described at some length. It now appears from the investigations of Nell and Sebening that administration of thyroxine during or shortly before narcosis has scarcely any influence in causing a reversal or even an interruption of the narcosis, and it is only after prolonged treatment with thyroxine, and consequent rise in the basal metabolism, that any effect on the narcosis is to be expected.

As we go to press an interesting report comes from Australia. Bolliger has demonstrated from experiments on animals that sodium thiosulphate, given intravenously or subcutaneously, has a certain detoxicating effect in avertin intoxication; he shows also that avertin narcosis is followed for some days by an increased

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tolerance for the drug. Simultaneous rectal administration of avertin and hypertonic sodium thiosulphate solution delays absorption of the avertin; with a 30 per cent. solution of thiosulphate it may become almost impossible to induce narcosis in a dog. In cases of overdosage with avertin, high rectal irrigation with a warm hypertonic solution of sodium thiosulphate acts as a restorative, if applied before cardiac failure occurs. Bolliger thinks that the detoxicating action of thiosulphate is non-specific and is probably due to an increased formation of glutathione, the detoxicating properties of which are recognized. Further work and clinical trials will of course be necessary to confirm these findings, but the discovery that sodium thiosulphate has this property will be of interest to those using avertin.

A case of fatal colitis following the use of avertin is reported by Wymer. The dose was large—1.6 gm.-kg., or nearly double the ordinary dose. After operation the rectum was washed out with saline solution, but the patient never recovered consciousness and died in forty-eight hours. Necropsy revealed a severe necrosing phlegmonous inflammation of the ascending colon. Wymer admits that the dose was unusually large, but he thinks that the injection was pushed too far and that having reached the ascending colon it was not removed by the lavage. He is certain that the solution was not decomposed by overheating.

The action of avertin in nephritis has been studied by Veal, Phillips, and Brooks. Experiments on rabbits clearly indicate that avertin should not be used as a general anæsthetic in cases where impairment of kidney function exists. In normal cases avertin is promptly excreted through the kidneys as a compound of glycuronic acid, but in nephritic cases no adequate removal takes place through the kidneys, and the drug accumulates in the system. In nephritics the anæsthetic and lethal doses are very close, leaving a very narrow margin of safety.

Barbituric acid derivatives.—During the last few years the use of derivatives of barbituric acid as basal narcotics has made rapid progress. The compounds at present in general use are: *Amytal*, its sodium salt, *Sodium-Amytal*, and *Nembutal*. In addition to these may be mentioned several in use chiefly on the continent, such as *Pernocton*, *Somnifaine*, and *Numal*. These compounds are given orally or intravenously to produce basal narcosis, just as avertin is given rectally for the same purpose, anæsthesia being completed by means of an inhalation anæsthetic.

Reporting on the intravenous use of barbituric acid derivatives, the Council on Pharmacy and Chemistry of the American Medical Association reviews the subject very thoroughly, discussing the effects on the blood and on the various organs as reported in the literature. The conclusion arrived at is that any advantages that may exist in the choice of barbituric acid derivatives as aids to anæsthesia can easily be procured through administration by the mouth, with the further advantage of avoidance of the complicated technique of intravenous injection. About the only argument in favour of the intravenous route is rapid action in an emergency. For these reasons the intravenous use of barbituric acid derivatives should be limited to conditions in which oral administration is not feasible, either because the patient is unconscious or because he resists, or to cases where very prompt action is imperative.

Amytal: Sodium-Amytal.—McCann and Fallon report on the intravenous use of sodium-amytal as a basal narcotic in 130 surgical cases. Ether was the supplementary anæsthetic except for thyroid operations, for which nitrous oxide and oxygen were used. The amount of ether required was reduced by 25–75 per cent. Amytal caused a transient fall of blood-pressure, which when necessary was controlled by adrenalin. Patients slept about four and a half hours after operation and

were lethargic for twenty-four hours longer. They remembered little of the experience on the day of operation. Restlessness developed as consciousness returned, but this was controlled satisfactorily by morphine. The only serious complication was pulmonary œdema, which occurred in four cases—twice in the presence of advanced cardiac disease, once with a history of lung abscess, and once with no such history. Three of these patients died from pneumonia.

The pharmacological properties of amytal are reviewed by Garry, who gives a very full account of its action on laboratory animals. When given orally its action is slow and uncertain, but intravenous administration causes very rapid onset of narcosis, which lasts several hours. The injection must be made slowly because of severe circulatory disturbances. Amytal has a definitely toxic action on the heart and a peculiar action on the involuntary nervous system. It causes a definite decrease in intestinal motility and the pylorus is tightly closed. Although amytal has been definitely disappointing as an anæsthetic in physiological research work, there is no reason why its pharmacological actions should be a hindrance to its use as an anæsthetic in man, so long as it is properly used.

Nembutal (Pentobarbital-Sodium).—This compound, though of quite recent introduction, has already won high praise as a basal narcotic. Swanson and Shonle find that in dogs it produces shorter sleep and brings about earlier recovery than does sodium-amytal, also that it does not influence the vagal response to electrical stimulation while sodium-amytal inhibits it. It lowers the blood-pressure, depresses respiration, and diminishes the body-temperature. Repeated injections of anæsthetic doses do not produce tolerance. It appears to protect rabbits from acute cocaine poisoning.

O'Sullivan and Craner have employed a combination of nembutal and chloral hydrate by mouth as a sedative to relieve the pains of labour in sixty cases. Their method is as follows: An initial dose of nembutal, 3 grains in capsules, and chloral hydrate, 30 grains in sweetened lemonade, is given when the os uteri is partially dilated and regular pains are present; the drugs are given separately. Subsequent doses of $1\frac{1}{2}$ grains nembutal and 30 grains chloral hydrate are given, beginning two hours after the initial dose and afterwards every three or four hours, not exceeding a total of $7\frac{1}{2}$ grains nembutal and 120 grains chloral hydrate in twelve hours. Restlessness was noted in twelve cases, but in only two was it at all severe. Labour was painless in thirty-seven cases; the results in nineteen cases are described as 'very good' and 'good'; in four cases the effect of the drugs was unsatisfactory as regards amnesia. No ill-effects to mother or child were noted, and the results on the whole are regarded as very satisfactory.

Pernocton.—This barbituric acid derivative is issued as a 10 per cent. solution in ampoules of 2.2 c.cm., this being the average dose for 25 kg. (56 lb.) of body-weight. It is given intravenously, slowly, injection being stopped as soon as the patient goes to sleep. It may be supplemented by ether or nitrous oxide and oxygen. As already stated, its use has hitherto been confined mainly to the continent, but recently several reports have come from America. Friedlaender has used it in over 1,000 cases without fatality. For minor operations he uses it alone; for major surgery he supplements it with a small amount of ether. Brown, Moloy, and Laird report its use in 133 obstetric cases, in which it was given alone, and in twenty gynæcological cases including laparotomy, vaginal plastic repair, and curettage, in which it was supplemented with nitrous oxide and oxygen. In the obstetric cases the average dose was 4.4 c.cm., with an occasional repeat dose; in the gynæcological cases the maximum dose was 5 c.cm. Restlessness was noticed in several cases. On the whole its use gave satisfaction.

The Cervical Pessary—A Menace to Health and Life

By H. O. JONES, M.D., Chicago

(Abstracted from the *Journal of American Medical Association*, Vol. XCVIII, May 14th, 1932, p. 1738)

THE widespread use of different types of cervical pessaries, presumably for therapeutic purposes but in reality for contraception, prompts this report. Physicians are led to the belief that these instruments are beneficial to patients suffering with dysmenorrhœa, or at least that they are harmless. Both assumptions are false. Within the last few years more than a dozen patients have been seen in the gynecologic service at St. Luke's Hospital with severe pelvic peritonitis and cellulitis due to infections originating about these pessaries.

Reviews

THE 'MEDICAL ANNUAL': A YEAR BOOK OF TREATMENT AND PRACTITIONER'S INDEX, 1932.

—Edited by C. F. Coombs, M.D., F.R.C.P., and A. R. Short, M.D., B.S., B.Sc., F.R.C.S. 50th Year. Jubilee Volume. Bristol: John Wright and Sons, Ltd., 1932. Pp. C plus 676. Illustrated. Price, 20s.

WITH this issue the *Medical Annual* completes fifty years of publication. The editors have taken this opportunity of adding a special feature to their book in the form of a portrait gallery of their contributors, past and present. Medical authors do not as a rule follow the practice adopted by some authors in other classes of literature and preface their volumes with their own photographs. Therefore this opportunity of seeing a photograph of a writer with whom we are personally not familiar is very welcome. The portraits are necessarily small, but they are particularly clear; there are about two hundred photographs.

The advantages of the treatment of pernicious anæmia by intravenous liver extract—as opposed to oral administration—have been discussed, but a great deal more work has been done on this subject during the last few months, so that next year it will be possible to give a more complete review of this new advance in liver therapy and its limitation will be seen in better perspective. The value of massive doses of iron salts in anæmia of the microcytic type is also well brought out.

Gold has not quite lived up to its promise in the treatment of pulmonary tuberculosis, but it has proved of considerable value in lupus erythematosus. It has been shown that ammonium nitrate enhances and prolongs the action of the new mercurial diuretics such as merbaphen, salyrgan and novasurol. The value of suprarenal cortical extract in Addison's disease has been further demonstrated, but generally speaking the results have fallen short of the early expectations. In the treatment of cerebro-spinal meningitis anti-serum by cisterna puncture is advocated in preference to the ordinary intra-thecal administration.

Surgery in the treatment of pulmonary tuberculosis is discussed and the relative values of thoracoplasty, pneumothorax and phrenic evulsion are considered, the general opinion appears to be that the last named is the most generally useful, but of course circumstances dictate the choice. For the treatment of fractures under conditions where a general anæsthetic would be difficult to give or perhaps not quite necessary, local anæsthesia is of considerable value both for reducing pain and causing relaxation of the muscles. A considerable advance has been made in general anæsthesia by the employment of 'basal narcosis'. There has been a general tendency of recent years to pay a little more attention to the feelings of the patient. To many patients the journey to the theatre was a terrifying

experience, but now they need never recover consciousness during the time they are out of their beds. Nembutal and pernocton are the basal anæsthetics which seem to meet with most approval.

There is a tendency nowadays to encourage young girls to live normal lives during the menstrual period; the effect is both physical and psychological. A trichomonas infection of the vagina seems to be more common of recent years. It does not seem to have serious sequelæ, but is a cause of annoyance to the patient and is sometimes mistaken for gonorrhœa. An interesting advance in radiography is the use of thorium dioxide to show up the spleen and liver. There is a very interesting article on the causes of toothache which the general practitioner should find useful, and another new feature of this year's *Annual* is an article on canine distemper and its prevention; this is a subject upon which the family physician is frequently asked for advice and this review will help him considerably.

By way of closing this review we will quote a paragraph from the editors' introduction:—'Once again, therefore, it is our pleasure to bring to the notice of the medical profession abundant proof that old methods are being discarded and better ones introduced, and that we owe it to our patients to attempt to keep up with the new knowledge'.

In their 50th issue the editors and publishers have in every respect maintained their own extremely high standard.

L. E. N.

A TEXTBOOK OF MEDICINE.—By various authors.

Edited by J. J. Conybeare, M.C., M.D., F.R.C.P. Second Edition. Pp. 1004 with 26 illustrations and 14 skilagrams. Edinburgh: E. & S. Livingstone, 1932. Price, 21s. Obtainable from Messrs. Butterworth & Co. (India), Ltd., Calcutta, Rs. 15-12.

TEXTBOOKS of medicine are apt to suffer from one of two defects; either the author is so anxious to reduce the bulk of the book that it becomes a mere synopsis, almost unintelligible to the beginner, and of little use except as a cram book for the final examination; or else he finds the subject so fascinating that all considerations of space are foregone, and the result is a voluminous tome suitable chiefly as a library volume for reference for the practising physician interested in a given subject.

Dr. Conybeare has successfully avoided both these dilemmas, and the result is a textbook which is pre-eminently suitable for the medical student. Although there are fourteen contributors to the book, yet its bulk remains within standard limits; and whilst there is scarcely a redundant sentence in the book, yet the amount of information given in it is amazing, and it is accurate and up to date. Particularly well written are the introductory sections—chiefly physiological in character—to the sections on diseases of the heart, kidneys and central nervous system; these enable the student to grasp the fundamentals of the subject before passing on to the different diseases associated with the system concerned. Further, the arrangement of the book is sound. Thus the infectious diseases are considered together in one section of 161 pages, without attempting to classify them according to the causative micro-organisms concerned or to the bodily system chiefly involved. In this way typhoid and paratyphoid fevers are considered among the infectious diseases, and not as diseases of the intestine; tuberculosis is considered as a general entity first, and the manifestations of it in the different organs under sub-heads of this section; again, venereal diseases are considered together as one group.

The illustrations have obviously been very carefully selected and every one of them is good. The student will here learn what a skiagram of a 'normal' chest looks like, as contrasted with one which shows definite tuberculous infiltration. The electrocardiograms are particularly good, and will go far towards teaching the student the interpretation of this difficult subject.

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In one point the book will appeal to students in the tropics. The section on tropical diseases, some 30 pages, is written by Lieutenant-Colonel H. Stott, I.M.S., King George's Medical College, Lucknow. Although extremely brief, yet this section is accurate and to the point. In this feature, the book is far more satisfactory than many larger works in which the sections on tropical diseases are compiled by writers with no tropical experience. The ordinary medical student in Great Britain will not want much information about tropical diseases, but the man who is going out to the tropics will find here a brief synopsis which will lead him on to more specialised books such as Manson-Bahr's 'Tropical Diseases'.

The author and his collaborators have been careful not to waste space on descriptions of clinical and laboratory tests and methods; numerous laboratory manuals on these already exist. In connection with the Wassermann reaction, for example, what the medical man should know is not all about antigens and complement-deviation, but how to take the specimen of blood to send to a standard laboratory, and how to interpret the result when he gets it.

The popularity of this book is shown by the fact that a second edition has been called for in little more than three years after its first publication. In the present edition the sections on renal diseases, on diseases of the blood, and on the anæmias have been largely re-written in the light of modern work. Other sections have been extensively revised and partly re-written. Yet the bulk of the volume has not increased, thanks to judicious pruning.

Whilst we would specially recommend this book to medical students, yet we think that the general practitioner will also find it very useful. There is many a man in general medical practice whose experience and clinical acumen is extending daily, but who has not had the time to keep abreast of modern developments; in this book he will find summarised information on recent advances which he has missed.

The format and general get-up of the book are very good, as is to be expected from its well-known Scottish publishers.

A HELMINTHOLOGICAL SURVEY OF SOUTHERN RHODESIA.—By William K. Blackie, M.B., Ch.B. (Edin.), D.T.M. & H. (Eng.). Memoir No. 5. Published by London School of Hygiene and Tropical Medicine, 1932. Pp. 91. Illustrated. Price, in cloth 10s. 6d.; in paper 8s.

This is an account of a general helminthological survey of Southern Rhodesia, a tract of country 151,000 square miles in area with a native population of 1,040,000, with 48,000 Europeans and about 4,000 Asiatics. The time occupied in this extensive work was only nine months, and the technical staff apparently only consisted of Dr. Blackie and Mr. McDonald. As a consequence of attempting such a large undertaking with so small a staff the reader gains the impression of rather breathless haste involving the inquiry. Because more than once such a sentence occurs as 'sufficient time was not available', etc., to fully investigate some particular point.

The method of stool examination employed was rather crude when one considers the vast amount of work that has been done in improving this technique, and the several satisfactory egg concentration methods one can choose from. An emulsion of the stool was made in water, this was strained and a smear (presumably a single preparation) of the centrifuged deposit was examined. If stools had to be kept formalin was added, and it is stated that this formed a satisfactory emulsion. In the experience of the reviewer formalin has been found to cause considerable coagulation of faecal material with consequent increase of 'camouflage' and masking of eggs. Nevertheless it is stated that 'the concentration was sufficient for the detection of even light infections'. How this conclusion, which is contrary to general experience, was arrived at is not clear, as there is no mention of control tests with more efficient methods of egg concentration.

Schistosomiasis which appears to be the most important helminthic infection in the country occupies 35 of the 88 pages of the report, and there is a full account of the whole subject as it affects the Colony. Included in this section there is an interesting account of a recently described schistosome (*S. matthei*) previously described in sheep and man in the Transvaal, but found in S. Rhodesia to parasitise cattle and baboons as well, and from the account of the pathology in man this trematode will probably prove of considerable importance in the locality.

Cestodes of the species found in most parts of the world are present but are apparently not common.

Among the nematodes, hookworm is the most important infection. No attempt to estimate the severity of the infections was made except to examine the numbers of worms recovered post-mortem in a few cases, and the general conclusion is that infections are as a rule light. Although the author is very much against estimating severity of hookworm infections by means of the egg count he makes indirect use of it, for he quotes the work of others whose findings are wholly based on this method, and he himself states that incoming natives are more heavily infected than those resident in the Colony for some time. He reaches this conclusion by '..... the impression one obtains from the differences in the case with which hookworm eggs can be demonstrated in the stools'; this appears to be using the principle of egg counting without putting down the actual number of eggs observed.

There is also an account of *Ternidens deminutus* which confirms the recent work of Sandground on the importance of this parasite to man in southern central Africa. *Strongyloides fulleborni* the common species parasitising monkeys has been found more than once in man, sometimes in company with *S. stercoralis*. The other common nematodes of man such as ascaris and enterobius were found but are not common.

The information provided in this report is mainly of local interest, and in view of this the price, viz, 10s. 6d. for cloth and 8s. for a paper covered copy, is rather high. The cost has probably been increased by the inclusion of seven plates, four of which show river pools or dry river beds which are of no special educational value.

P. A. M.

Annual Reports

KASHMIR C. M. S. HOSPITAL. REPORT FOR 1931.
MYSORE: PRINTED AT THE WESLEYAN MISSION PRESS. 1932.

The annual report of this well-known hospital, illustrated with excellent photographs, is always of interest. In 1931 the total out-patient attendance was 44,574, including 20,472 new patients seen during the year; in-patients numbered 2,006, including 1,346 surgical cases; and laboratory investigations 1,900. Patients come from all over Kashmir, some from Tibet, others even from places as far remote as Yarkand and Khotan. Whilst the majority of the patients are Mohammedans, the medical and nursing staff are Christians or Hindus, and yet the utmost tranquillity prevails. During the riots in 1931 the mission doctors and nursing sisters were welcomed into a mosque where the wounded had been collected, whilst many of the injured were treated at the hospital.

A special feature of the work in Kashmir is touring. In the spring tour in the Kashmir Valley over 2,000 patients were treated, and the daily attendance was sometimes as high as 400 to 500. An interesting photograph shows an operation for cataract being carried out in the open air on a camp bed. The autumn tour was through the Kishen Ganga Valley; here the villages are more scattered and the population less dense, but more than 1,000 patients were seen.

The council of the Royal College of Surgeons of England annually elect by ballot two Fellows, and in 1931 Dr. Ernest Neve had the honour of being one of the two Fellows elected 'for distinction in surgery or allied science'. This is a fitting recognition of his life-long and splendid services to the Kashmir C. M. S. Hospital.

The work at Srinagar is very largely surgical; major operations in 1931 totalled 988 and minor operations 6,126. In major operations bone disease is especially responsible—211 cases. These are often the result of neglected injuries followed by osteomyelitis. Tumour cases numbered 327, including 152 of tuberculous glands. The tendency to use Kashmir as a sanatorium for patients from the Punjab suffering from tuberculosis has led to widespread dissemination of tuberculosis in all its forms in the Kashmir Valley. Amongst the minor operations, operations on the eye constitute far and away the largest group. On the medical side nephritis is very prevalent, many of these patients having cardiac trouble as well. Here the rigors of the Kashmir winter and the altitude of the surrounding valleys are responsible. Goitre and anemia testify to deficiencies in the ordinary diet and water supply of some districts, and the universal prevalence of intestinal parasites to the necessity of reform in general hygiene. Skin diseases are extremely common. 'Probably quite 25 per cent. of the patients attending the hospital are suffering from preventable diseases, and, but for the factors of diet, ignorance, poverty and lack of sanitation, ought not to be ill at all'.

The total income for the year was Rs. 54,688 and the total expenditure Rs. 46,821. Grants from the Kashmir State amounted to Rs. 9,999, but almost all the remaining income is derived from fees, donations and subscriptions, and the hospital is almost entirely dependent on public support. Its splendid record of pioneer work should ensure a continuance of such support.

REPORT OF THE HAFKINE INSTITUTE FOR THE YEAR 1930. BY MAJOR L. A. P. ANDERSON, OFFICIATING DIRECTOR. BOMBAY: GOVERNMENT CENTRAL PRESS, 1932. PRICE, 6 ANNAS.

ALTHOUGH somewhat belated this annual report is full of interest. It commences with an obituary notice and portrait of the late Professor W. M. Haffkine (1860—1930). India owes an immense debt to him as one of her greatest pioneers in protective inoculation against cholera and plague, and the story of his life is full of interest. Born of wealthy Jewish parents in Odessa in 1860, he graduated from the University of Odessa in 1884, and was later Assistant Professor of Physiology in the University of Geneva. Ferran in 1885 in Spain was the first to attempt to immunise persons against cholera, using cultures grown in liquid media; his results were inconclusive, and Haffkine commenced work on the problem in Paris in 1889 under Pasteur himself. He maintained the virulence of his strain of the comma vibrio by successive passages in animals, obtained an exalted strain, and from it a successful vaccine. Being anxious to test the efficacy of this vaccine in man, he was contemplating a visit to Siam when he came in touch with Lord Dufferin, then British Ambassador in Paris, and a former Viceroy of India. Lord Dufferin communicated with Lord Lansdowne, the then Viceroy, and the India Office; Haffkine visited London and delivered lectures, and was finally sent out to Calcutta on a voluntary mission in 1893.

In his first year of work he discovered that the populations in northern India were quite willing to receive the prophylactic inoculation, but not so the inhabitants of lower Bengal. In the second year, however, he was able to introduce inoculation into many of the endemic areas, in which a total of 19,473 persons were inoculated. The results were decidedly encouraging, and in 1895 Haffkine was back in Europe,

lecturing, and in consultation with Koch, who studied his reports and confirmed the value of the vaccine. To-day Haffkine's vaccine against cholera is sent out annually in enormous quantities all over India from the Central Research Institute, Kasauli, whilst the Public Health Department of Bengal has a special laboratory of its own in Calcutta for the sole manufacture of this vaccine.

Haffkine returned to Calcutta in 1896, and received pressing demands from the tea planters in Assam to inoculate their coolie population. He now received financial backing from Government for the first time. At this juncture, however, bubonic plague broke out in epidemic form in Bombay, and Haffkine was deputed by the Government of India to study the problem and if possible devise a protective form of inoculation against it. His laboratory was situated in turn in a single room in the Grant Medical College, then in a bungalow at Malabar Hill lent by the Bombay Municipality, in a bungalow lent by H. H. the Aga Khan, and finally in Old Government House at Parel. The latter became the official Plague Research Laboratory under Haffkine as its Director-in-Chief in August 1899.

During this period, Haffkine discovered the stalactite growth of the plague bacillus in nutrient broth and protected rabbits by a vaccine made from such cultures and sterilised by heat. Having inoculated himself with 10 c.cm. of the vaccine, and finding that this proved harmless, Haffkine next carried out a large scale protective experiment on the prisoners in the House of Correction at Byculla. The Indian Plague Commission visited India during 1898-99, made a searching enquiry into the efficacy of Haffkine's prophylactic, and fully confirmed its value. Plague assumed huge epidemic incidence in the Punjab in 1901, and it was decided that in the outbreak of 1902 inoculation should be resorted to on a very extensive scale. Very large supplies of vaccine were prepared beforehand and all arrangements made.

Most unfortunately, the opening of the 1902 campaign was associated with the 'Malkowal disaster' in November of that year, when 19 persons who had been inoculated with the vaccine developed tetanus and died from it. A Commission was appointed by the Government of India to enquire into the occurrence and it was found that the vaccine contained tetanus organisms; the Commission accordingly recommended that in future the vaccine should be carbolised. Haffkine bore the strain of the enquiry with great fortitude, and maintained throughout that the contamination had not occurred at Parel; later, it transpired in the evidence that the cork of the phial concerned had been dropped on the ground when the vaccine was used and had then been replaced in the bottle, this explaining the probable source of the contamination. Haffkine left India in 1904 on a year's leave pending the final decision of Government, but in 1907 was re-instated by the Secretary of State, and received the C.I.E. The years of anxiety and injustice, however, had rendered him a broken-hearted and disappointed man, and when he returned to India it was as Director-in-Chief of the Biological Laboratory in Calcutta. He retired into seclusion and obscurity at Boulogne-sur-Seine in 1914, and died in 1930.

'Twenty-eight years have now rolled by since the Malkowal disaster' writes Major Anderson; 'successive attempts have been made to improve upon the original method of manufacturing Haffkine's plague prophylactic, but these have only resulted in essentially adhering to his original method. Experiments carried out in India and elsewhere have demonstrated the superiority of Haffkine's prophylactic to other types of plague vaccine. Although the incidence of plague in India has been on the decline, yet the demand for the prophylactic vaccine has been steadily on the increase. Since its introduction as a prophylactic measure, during the past 34 years no less than 33,391,339 doses have been sent out of the laboratory. The reception of inoculation has undergone a profound change in India. Where riots were liable

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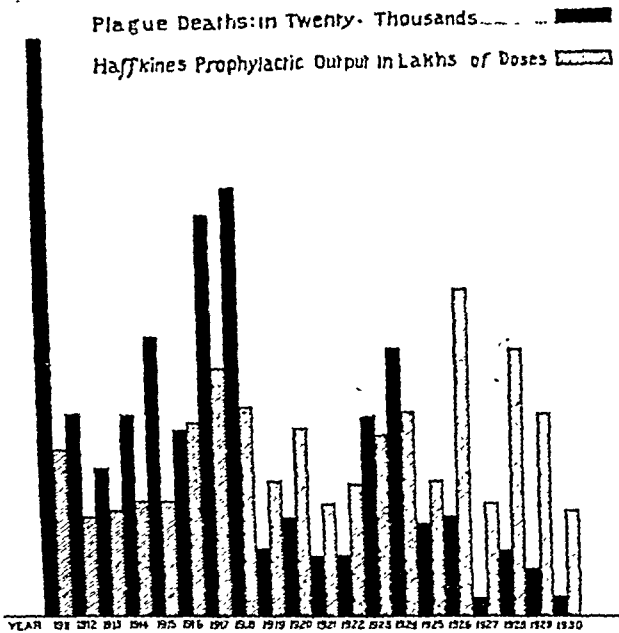
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to occur when inoculation was pressed, recently a riot was threatened because the supply of the vaccine ran short. No further testimony is needed to prove public recognition of its efficacy as a protective measure against plague. It is a fitting tribute to the splendid work of Haffkine in India that the Government of Bombay have renamed the former Bombay Bacteriological Laboratory at Parel, the Haffkine Institute.

An interesting graph in the report, here reproduced, shows the annual output of antiplague vaccine in relation to the incidence of plague in India for the years 1911-1930.

Plague and the output of Haffkine's plague prophylactic



In 1912 for each recorded death from plague only 2.3 doses of vaccine were issued; in 1930 the corresponding figure was 32 doses. Other factors undoubtedly enter into the picture, but the wholesale use of Haffkine's prophylactic in the Punjab and elsewhere has undoubtedly contributed very much to the remarkable decline in plague in India in recent years.

Dr. Gore continued his work on the cultural reactions of the *B. pestis* during the year. No method is as yet available to prevent occasional contamination of the seed broth cultures, but methods for the immediate detection of such contaminants have been worked out. Major Sokhey and Dr. La Frenais have continued their work on the standardization of Haffkine's prophylactic; here the laboratory bred white mouse has proved the animal of choice and in the biological assay of any brew an interval of ten days is allowed between inoculation and test. In spite of all attempts to produce a vaccine prepared from growths on agar, Haffkine's broth vaccine still gives better results; once it is biologically standardized the disadvantages attending high dosage and reaction may be reduced to a minimum.

Further abstracts from the report are as follows:—

Parasitology and transmission of plague.—This inquiry, under the auspices of the Indian Research Fund Association, was continued on the same lines as last year, until Major Webster proceeded on leave in August 1930. Among their more important results the following may be mentioned: (1) *X. brasiliensis* has been shown to be a particularly regular transmitter of plague under experimental conditions, and capable of maintaining a continuous transmission experiment throughout the year under certain conditions; (2) starved infected *X. astia* were found capable of restarting an epizootic among rats after intervals of 3 to 7 days.

An attempt to carry out with *Pulex irritans* transmission experiments, similar to those recorded with the three species of rat flea, met with the initial obstacle that no satisfactory supply of laboratory bred fleas of this species could be obtained by any method of breeding hitherto tried. Major Webster calls attention to the caution necessary in dealing with this particular species.

A series of experiments was carried out to determine the value of various substances reputed as flea repellants.

Drs. Gore and Chitre in collaboration determined the extreme period after death of plague infected rats within which plague infection could be detected in the decomposing bodies. They arrived at the important conclusion that in the climate of Bombay, during September and October, a negative finding two days after death of the animal did not exclude the possibility of the death being due to plague.

The treatment of plague. (a) Antiplague serum.—Dr. Naidu and his assistants have devoted most of the year under review to the preparation on a large scale of their curative serum, details of which were reported last year.

A most important trial of the serum in human cases under carefully controlled conditions was carried out and is reported in some detail later on in this report. While the number of cases available for trial was unfortunately too small to permit of definite conclusions, the results were more than encouraging and it is hoped to institute further trials on a larger scale during the next plague season.

Chemotherapy of plague.—Rev. Father Caius and Dr. Wadia continued their work on this problem on the same lines as last year and have further investigated the twelve halogenomercuriphenols prepared by them.

The 'safe dose' of these drugs for rabbits was determined and some of them were tried in the treatment of plague infected animals. They regard their results as encouraging.

THE PHARMACOLOGICAL UNIT

A very valuable contribution made this year by Father Caius and Dr. Mhaskar to the Indigenous Drugs inquiry has been the examination of Indian plant remedies of reputed value in snake-bite. No less than 498 drugs, the product either of individual plants or combinations, administered in multifarious ways, were investigated. All were without effect in animals injected with a lethal dose of venom. It is believed that this investigation has covered all the reputed remedies for this condition which an exhaustive search of the literature has been able to reveal, and which are likely to be introduced in the form of proprietary preparations for many years to come.

The investigation of the indigenous medicinal drugs has continued steadily throughout the year and a report of this work has been published in the *Indian Medical Research Memoirs*.

Work on scorpion venom has been hampered by what appears to be a somewhat illogical objection on the part of the postal authorities to the transmission of the living animals through the post.

THE BIOCHEMICAL UNIT

During the year under review Major Sokhey and his assistants have begun a valuable investigation by chemical methods into the composition of the standard broth used for the preparation of Haffkine's vaccine with special reference to the fractions used up by *B. pestis* in its growth and the substances elaborated by this organism during growth. This work was briefly referred to above when discussing vaccine preparation.

The bearing of this work on plague vaccine preparation is basic in nature. It should help to solve certain outstanding problems of considerable importance in this connection, namely, whether it is possible to reduce the present large dose, and the toxicity of the broth vaccine and whether an agar vaccine can be used instead of a broth vaccine.

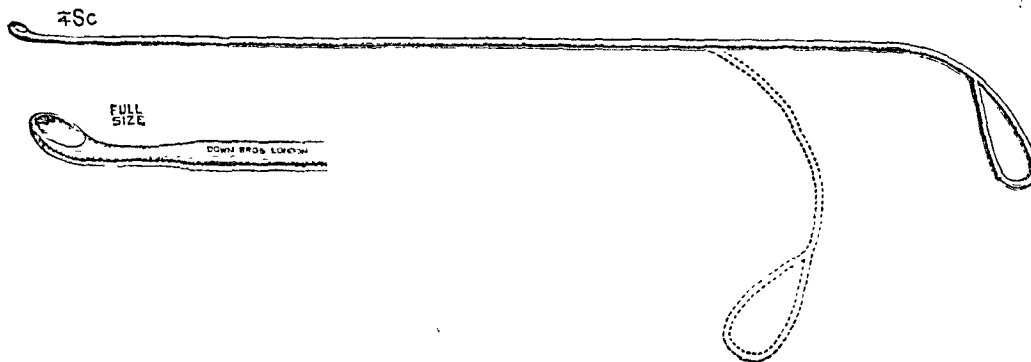
Work on lines similar to that carried out last year was continued in regard to the anemias, and the determination of normal standards for blood examinations.

varicose vein through a small incision. The removal of small skin tumours and of samples of skin for biopsy is much facilitated by using this instrument.

A NEW SIGMOIDOSCOPIC SCOOP

By M. A. ARAFA, M.R.C.P. (Lond.)

THE necessity of getting a good specimen of the scraping of ulcers commonly found in the rectum and sigmoid in various conditions of ulcerative-colitis and proctitis and the different types of dysenteries, or a fresh specimen of the stools, has led me to devise a



special scoop which would be easy to use during a rectoscopic or sigmoidoscopic examination. The spoon devised by Strauss and in general use in sigmoidoscopic examinations has certain disadvantages limiting its application.

The Strauss spoon is not in one piece with the stem and has to be screwed on before use and the fitting of the handle makes the instrument unsteady. Moreover, being a fixed length, the spoon is not convenient to use with a shorter sigmoidoscope or proctoscope.

The scoop which I have devised is in one piece, handy to use and steady in operation; being flexible, it can be bent to use with short proctoscopes like those used by Dr. A. Hurst and Dr. Bensaupe, and can also be of service when taking scrapings through the long proctoscopes and sigmoidoscopes of Strauss and others. The spoon is made of steel and mounted on a malleable pewter stem; with it I have obtained, through various patterns of instruments, good specimens for immediate cytological and bacteriological examination.

I have to thank Dr. Hurst of Guy's Hospital and Dr. Biggam of the Kasr-el-Aini Hospital, Cairo, for their kind encouragement and assistance.

Messrs. Down Bros., London, are the makers.

BOVRIL, LTD.

PRESIDING at the Thirty-Fifth Annual General Meeting of Bovril Ltd., held in London, on 24th February, 1932, the Lord Luke of Pavenham (Chairman) said the Bovril Australian subsidiary ran their cattle estates of many million acres in Australia; whilst the Argentine Estates of Bovril Limited performed a similar service in the Argentine.

The advertising all over the world had cost them about the same, and, at any rate at home, seemed to have been as effective as usual in keeping up their sales, in spite of conditions that could not quite be called normal.

An American journal had recently published under the title 'Britain's Bottle', a lively, if somewhat highly coloured, history of the Company. The writer attributed much of the success of Bovril to the Directors' recognition of the fact that 'The sense of fun never sets on the British Empire'.

For twenty-five years, he said, Bovril had not only catered to the British appetite for beef, but had been almost an almanack of British humour.

The number of political and other cartoons which had been based upon Bovril advertisements showed how strongly Bovril advertising had impressed itself upon the national consciousness, he might even say Empire

consciousness, for cartoonists throughout the Dominions had also drawn upon the same source of inspiration.

Sir James Crichton-Browne said it was perhaps hazardous to indulge in prophecy, but he ventured to predict that better and brighter days were in store.

Referring to Lord Playfair, the first Chairman of the Bovril Company, and one of the highest authorities on the chemistry of foods, Sir James said we were perhaps just a little forgetful of the great fundamental principles of dietetics laid down in his time. All attention was concentrated at present on the vitamins and hormones. The discovery of these was a momentous advance, but there was in some quarters a tendency

to magnify their rôle. With all their virtues, they were not foods, and though you might be supplied with a pound of each of them daily, you would perish miserably of starvation. We must go back to the fundamental and essential elements of food, the proteins, the carbohydrates, the fats and the mineral constituents, and if we partook of them in sufficient variety we could safely leave the vitamins and hormones to look after themselves.

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Original Articles

CHLORAL HYDRATE AND PARALDEHYDE AS DRUGS OF ADDICTION

By R. N. CHOPRA, M.A., M.D. (Cantab.)

LIEUTENANT-COLONEL, I.M.S.

and

GURBAKSH SINGH CHOPRA, M.B., B.S.

(Drug Addiction Inquiry, Indian Research Fund Association)

Series No. 15

CHLORAL hydrate and paraldehyde belong to the group of drugs known as soporifics or hypnotics. The chief use of this class of drugs is in the treatment of insomnia, one of the worst evils of modern times from which mankind can suffer. The physical and mental consequences of sleeplessness are such that the sufferers are driven to the frequent use of hypnotic drugs, which in many cases leads to a permanent craving or addiction.

Louis Lewin (1931) in his well-known work *Phantastica* has drawn attention to addiction to this group of drugs which include chloral, veronal, paraldehyde, sulphonal, potassium bromide and bromural. Most of the cases referred to by him were patients who suffered from insomnia who were advised to take the drug by a physician. Instead of giving their patients rational treatment, i.e., investigating fully the causes leading to sleeplessness and removing them, medical men often resort to the easier course of giving powerful chemical substances with a soporific action. Again, certain manufacturers of medicinal drugs employ on their staff medical men and others who carry on an extensive propaganda by advertisements in the medical as well as in the lay press. By broadcasting literature extolling the wonderful sleep-producing and non-toxic effects of these drugs, they influence both the medical profession and the public. In this way dangerous substances belonging to this class, which have a powerful effect on the central nervous system, fall into the hands of the sufferers direct.

The incidence of addiction to chloral hydrate outside India is apparently rare, as only occasionally is a case reported. Although by a careful and searching enquiry a few cases of this habit may be collected, especially in modern cities in various parts of the world, there is no evidence of any extensive prevalence amongst the masses. It is probable that on account of its unpleasant taste, its irritant effects on the gastro-intestinal tract and its liability to produce cutaneous eruptions, addiction to chloral has not spread in the same way as have the cocaine or the opium habits. Habitual use of chloral hydrate, however, has been found to exist in

certain parts of the Punjab. This is not the outcome of the use of the drug in the treatment of insomnia, but is due to entirely different causes. Until a few years ago in that province potable country-made spirits were allowed to be sold to retail dealers in bulk and the vendors bottled the liquor themselves. Some of these ingenious people conceived the idea of diluting the spirit and adding small quantities of chloral hydrate to make up for the loss in its potency which would result from dilution. The knowledge that the drug had hypnotic and narcotic effects was undoubtedly obtained from the medical profession and compounders working in dispensaries. It was further learnt that the effects produced by chloral hydrate in many ways resemble those produced by alcohol, especially when the latter is taken in large quantities. When the two articles are taken together they act in a manner synergistic to each other and in this way the effect of either drug is largely increased. This knowledge, combined with the fact that chloral hydrate can be bought of any of the pharmaceutical chemists at about Re. 1-12 to Rs. 2 per pound without any restriction whatsoever to its sale, has led to the abuse of the drug described in this paper. The addition of a drachm or two added would easily make up for the removal of a substantial portion of the liquor from the bottle, the quantity being made up with water. Sometimes small quantities of chloral are added without any dilution of the liquor, to make the effects more potent in order to get a wider sale among a particular class of customer. Recently, the Excise Department have stopped the sale of spirit in bulk to the retail vendors and all the liquor has to be sold in sealed bottles. This form of adulteration is, therefore, no longer possible. Government have also prohibited the licensees of liquor shops to keep chloral hydrate in the licensed premises.

The idea, however, appears to have lingered and has reached the public in some of the districts where the use of country spirits is very prevalent among the population. This is particularly the case with the central districts of the Punjab which are largely populated with Sikhs. Owing to the rise in price of the country liquor, these people, who take the liquor not for the purpose of light stimulation—as is the case in western countries—but with the object of getting pronounced intoxication effects, found they could not get sufficient quantities of the drink with the means at their disposal. They, therefore, conceived the idea of themselves adding quantities of chloral hydrate to the liquor in order to get the desired effect. They procured the drug without difficulty and small quantities added to the potion gave them satisfaction. So closely did they find the effects of the mixture resembled the effects of the liquor itself that chloral hydrate in these parts is well known among the liquor-drinking

population as '*sukhi-sharab*' or dry liquor. This state of affairs first came to our notice several years ago when we were studying the opium habit in that area. At that time, however, we thought that such use of chloral hydrate was rare.

Major D. R. Thomas, I.M.S., Chemical Examiner to the Punjab Government, in a letter dated the 13th September, 1931, pointed out to this Government that a number of cases of poisoning were occurring in certain parts of the Punjab. These cases came mostly in bunches and were usually the outcome of drinking bouts with liquor adulterated with chloral hydrate. Major Thomas suggested that chloral hydrate and butyl chloral hydrate might be brought under the category of narcotic and dangerous drugs, and their free and indiscriminate sale to the public might be prohibited. We have, therefore, paid special attention to this subject and have recently investigated various facts in connection with the use of chloral hydrate, both for adulteration of alcoholic beverages as well as its use as a drug of addiction. So far as the Punjab is concerned we have found that, although adulteration of liquor on a large scale has been discontinued, the use of the drug by the liquor drinker for adulterating his own potion to enhance its effects is fairly common and is well known in certain parts of the central districts. Our enquiries show that a number of people who habitually take liquor in large quantities have resorted to adulterating it with chloral hydrate. Originally the idea was to add it to the liquor to increase its effects, when on account of high price they could not afford to buy sufficient quantities. Some have used the drug so frequently that it has resulted in the formation of a habit, and unless it is added to the potion satisfaction is not obtained. These persons have literally become addicts. Although the use of the drug is kept very secret, we found it to be fairly prevalent in certain parts of Ferozepore and Ludhiana districts. This is borne out by the fact that we were able without much difficulty to collect and study forty cases of this form of addiction to chloral in less than a month. We are very grateful to Major Thomas for giving us facilities to study his records and for giving us the details of cases of poisoning which have come to him for analysis.

As regards the similar abuse of chloral in other parts of India, so far as our information goes, the evil does not appear to exist at present. We have, however, found indications that in central India and in the Madras Presidency toddy is possibly adulterated with chloral hydrate or some similar drug in order to give it increased potency. Instances have come to the notice of the excise authorities of people liking the beverage supplied by certain shops, because it was much more potent than others,

although apparently the source of supply was similar. This may be due to medication of the beverage, but we have no evidence to confirm this. The excise authorities of other provinces have not detected any specific instances of such adulteration, although in one case in Madras chloral was detected in a specimen examined by the excise laboratory. Whether the evil exists at present or not, there is at any rate danger of the extended use of chloral and other similar drugs for adulteration of alcoholic beverages and the Excise Departments of various provinces should be aware of it.

Chloral habit.—With the advent of many new hypnotic drugs, chloral hydrate has been virtually erased from the list of medicaments in many western countries. This is due to the fact that not only has the drug an unpleasant taste and produces unpleasant effects, but it has a marked tendency to habit formation, the injurious consequences of which are too well known. On account of its low price chloral hydrate is still largely used in India and its action and uses are well known to the professions of medicine and pharmacy. Although there is little doubt that many of the liquor drinkers have used chloral hydrate at one time or other in the central districts of the Punjab, the confirmed chloral hydrate addicts do not form more than about 5 per cent. of the total number of the liquor-drinking population. Many of them are afraid to use the drug because of poisoning. Outside the small area mentioned above, the Punjab appears to be at present free from the abuse.

Modes of administration.—(i) Chloral hydrate is sometimes taken mixed with alcoholic drinks. When indulged in in this way it becomes absorbed into the system very quickly, its action is produced in a shorter time and the effects of the drug are enhanced. The ready solubility of chloral in alcohol increases its absorption into the circulation to an enormous extent. As chloral is a powerful drug, this method of taking it is not only harmful but dangerous. If the quantity ingested exceeds a certain limit death may result from the depressant action of the drug on the heart and paralysis of the organ. The margin between the dose producing the physiological effects desired by the addict and the dose producing toxic symptoms is very small. A number of fatalities have actually occurred in these areas and have been reported by the Chemical Examiner to the Punjab Government.

(ii) The more common method of taking the drug is by dissolving it in a little water and drinking it. It is also sometimes put in hot tea and milk, but this is uncommon. When it is dissolved in water it has a bitter aromatic taste, resembling more or less the biting taste of the country liquor. It is, therefore, sometimes flavoured with essences to give it a

pleasant smell and taste. As it takes some time for the drug to be absorbed the actual intoxication effects are not produced till half an hour or more after administration. It is a common practice for two or more persons to sit together in the evening and take the drug, they drink a potion and then take some meat or tasty food between drinks in much the same way as is done with alcohol. Those who cannot afford delicacies may take pickles or some other salted eatables to take off its taste from the mouth.

1. First and the most important reason for the use of the drug is as a substitute for alcohol or for enhancing the narcotic effects of alcohol. In the series of forty cases studied by us, 47.5 per cent. started the habit with this object. Alcoholic drinks, we have pointed out, are becoming more and more expensive on account of increase in the excise duty. For an average consumer of that class the cost has become too high to allow the daily consumption of a sufficient dose to produce the effects he desires. The reduction in the number of licensed shops

Analysis of 40 cases of chloral hydrate addiction studied in Ludhiana and Ferozepore

CAUSATION.				AGES TO START.						PRESENT AGE OF ADDICTS.						DURATION.							
Dose.	To replace and enhance the effects of alcohol.	Curiosity.	Insomnia, and disease.	1-20 years.	20-30 years.	31-40 years.	41-50 years.	51-60 years.	61 and up.	20 and under.	21-30 years.	31-40 years.	41-50 years.	51-60 years.	61 and up.	1 year and under.	2 years.	3 years.	4-5 years.	6-8 years.	9-10 years.	11 and up to 15 years.	16 and up.
1-30 gr.	9	6	4	3	11	4	1	..	..	..	7	7	4	1	..	3	2	1	2	7	3	1	..
31-40 gr.	5	5	3	2	5	4	2	..	..	1	5	4	2	1	..	..	4	3	3	2	1	..	..
41 and up.	5	3	..	1	5	2	..	..	..	..	6	1	1	..	..	..	1	2	3	2	..	..	..
TOTAL	19	14	7	6	21	10	3	..	..	1	18	12	7	2	..	3	7	6	8	11	4	1	..
Percentage.	47.5	35.0	17.5	15.0	52.5	25.0	7.5	..	..	2.5	45.0	30.0	17.5	5.0	..	7.5	17.5	15.0	20.0	27.5	10.0	2.5	..

Dose.—When the narcotic use of this drug was first learnt and people started taking the drug habitually, they did not know the safe limits within which they could keep the dosage to obtain its effects and at the same time avoid toxic symptoms. The result was that sometimes large doses were taken and severe toxic symptoms, such as loss of consciousness lasting for varying periods, and even fatalities occurred. Further experience appears to have made them more cautious and they now appear to keep within the safe dosage, though even now fatalities occasionally occur. A reference to the table will show that in our series the daily dose varied from 10 to 60 grains. In the 40 addicts studied by us, 47.5 per cent. took from 10 to 30 grains, 32.5 per cent. from 31 to 40 grains, and only 20 per cent. took above 40 grains daily.

Etiology.—The causes which lead to such use of chloral hydrate do not differ essentially from those leading to the opium habit. Chloral hydrate, however, is taken more for its narcotic and sedative effects and less for its sexual and pleasurable effects which form the main attraction in the case of drugs like cocaine. The habit of taking chloral is mainly attributed to three causes :—

has further made liquor less accessible. It is a well-established fact that as time goes on the habitué has to increase the quantity of liquor in order to get intoxication. He, therefore, looks for a cheap and easily available substitute. In old days *bhāng* (*Cannabis indica*) and *post* (unlanced capsules of *P. somniferum*) served this purpose quite well, but even these have become expensive and difficult to procure. Chloral hydrate on the other hand is cheap and easily obtainable from any druggist's shop. The addition of a small quantity of chloral hydrate will make a little alcohol go a long way.

The special attraction of this drug appears to be its power of setting up effects which resemble intoxication. It produces a state of mental and physical depression followed by sleep, which to the addict is like the feelings and sensations produced by alcohol taken in large quantities. The aim of liquor drinkers in India, we have already said, is to attain a state of intoxication and forgetfulness. The senior author has met a number of cases where the sole idea of the person taking liquor was to attain a state of oblivion. Such people drink half a bottle or even a bottle of country liquor without dilution in one draft in order to induce

a state of torpor, in which they may remain for the following 24 hours or even longer. It is the loss of perception and memory and the dulling of all bodily sensations which is the aim of these individuals and not merely a mild excitement or depression of higher areas. Alcohol and opium produce such an advanced state only after very large doses, and it takes a longer time to attain it. With chloral hydrate, such a state sets in with comparatively small doses, in a much shorter time, and with little cost.

2. *Curiosity and association.*—As with other drug addictions, association with addicts is responsible for setting up the habit in quite a large number of individuals. It is a well-known fact that persons addicted to drugs are in the habit of persuading their friends and associates to try new drugs which have been their latest experience. We have records of cases where chloral has been given by the habitués to a friend without the latter's knowledge. The potent effects produced excited curiosity, and repetition of this a few times led to the discovery of the drug and formation of the habit.

Some individuals have also been tempted to try the drug out of sheer curiosity, but in the majority of cases the first experience proved too much for them to repeat it. We have met with this type of case in Amritsar and Gurdaspore districts. A small number who are of neurotic disposition and are, therefore, prone to habit formation may be tempted to repeat the experiment. They get over the unpleasant preliminary effects and finally form a habit. People belonging to this group are generally young neurotic individuals between the ages of 20 and 30 years.

3. *Insomnia, fatigue and worry, physical and mental disturbances, irritability and hyper-excitability* were responsible for 17.5 per cent. of the cases of addiction in our series. The chief use of chloral hydrate in medicine is in the treatment of insomnia and as a sedative, and injudicious prescribing may lead to habit formation. It may be mentioned here that of late years the practitioners of indigenous medicine in India and some itinerant quacks also are beginning to appreciate the superior value of many of the drugs used in the western system and have begun to prescribe and dispense potent medicines, particularly those whose sale is not restricted by regulations. Chloral hydrate is one of the largest used of these medicines. It is difficult to say to what extent such indiscriminate use of the drug has led to habit formation but there is certainly great danger of it.

Age to start and present age of addicts.—A study of the table will show that in the majority of cases the habit was started before the age of forty years, as many as 92.5 per cent. falling in this category. Of these 77.5

per cent. started it in the third and fourth decade of life.

As regards the present age of addicts a similar state of affairs was evident, as many as 75.0 per cent. were between the ages of 21 and 40. The addiction would appear to be common between 21 and 40; above 40 years of age and below 20 it is very uncommon.

Duration.—A perusal of the figures given in the table shows that the addiction is of recent origin, the oldest case recorded was not much more than of 10 years duration. It would appear that the drug has been more used during the last 7 or 8 years than formerly.

Symptoms and effects.—The following description of the subjective and objective symptoms produced in those who take chloral hydrate habitually has been prepared from a study of forty cases analysed in the table. Immediately after taking the drug (whether dissolved in an alcoholic drink or in pure water) there is a feeling of constriction and warmth in the throat, and later in the epigastrium, somewhat similar to that produced by country liquors. Fifteen to thirty minutes after ingestion there is a transitory sensation of warmth all over the body, flushing of the face and heaviness of the head which is probably due to peripheral vaso-dilatation. The eyes are congested and the eyelids feel heavy and droop. The patient feels dull and sluggish, and as a rule in an hour or so sleep sets in; this is often sound and uninterrupted and usually lasts from 9 to 12 hours. Many of the persons taking it in moderate doses experience no other effects, but some have a mild feeling of weakness, asthenia and depression. In them there may also be disinclination to do physical or mental work both when under the influence of the drug and when awakening from the sleep.

In some of the addicts the sleep usual after a dose does not set in immediately. In them there is much dulling of perception, resembling that produced by large quantities of alcohol. We were informed by many addicts, who had indulged in chloral hydrate, alcohol and opium, that the effects of taking a dose of chloral closely resemble those produced by taking large doses of alcohol. The main difference is that the preliminary excitement, which gives a feeling of euphoria to liquor drinkers and sometimes a tendency to rowdiness and bravado, is entirely absent. The chloral addict is often morose and is not socially inclined. Unlike a person under the effect of alcohol, he is not talkative and likes to be quiet. Sleep finally comes on and he does not wake for many hours.

When the addict gets up after 9 to 12 hours he feels depressed, yawns, has a somewhat heavy head and wishes to sleep again. The sleep is not of as refreshing a character as natural sleep. He looks depressed, is reluctant to do any work and eagerly awaits the evening

dose. The eyes remain congested all day, the eyelids droop, there is loss of appetite, the tongue is coated with a thick fur and the bowels remain constipated.

Rarely, the chloral addict does not get the usual sleep at all, especially if he takes a smaller dose than that to which he is accustomed. Under these circumstances he feels miserable, becomes restless and irritable. He may get palpitation of the heart and in some cases there is a sensation of cold and shivering all over the body. We have not seen any cases going to a condition of delirium in our series as has been described by other observers. The addict may feel so miserable that he may have recourse to another dose, perhaps a larger one, in the hope of getting into a state of somnolence. The sleep generally comes, but if it does not, as sometimes happens, the repetition of doses may produce fatal results. Through the courtesy of Major D. R. Thomas, I.M.S., we have been able to record a case where the wife of a European official was prescribed this drug and formed a habit after its frequent use. She increased the dose gradually on her own account and finally succumbed to poisoning. During the 24 hours preceding her death she took more than 180 grains of the drug.

Lewin has described papular eruptions, blood spots on the skin, ulcerated fingers and spoilt nails, spasms of the bladder and urinary troubles, and pressure gangrene occurring among chloralists, but we have not come across these conditions in our series. Possibly these are accompaniments of larger doses taken for prolonged periods, or this may occur only in susceptible individuals. Pain in the limbs and in the back were also uncommon in our series.

All the addicts were uniformly of opinion that chloral hydrate is sexually a depressant drug. The addicts feel no desire for sex companionship while under its influence and after its prolonged use a condition of sexual neurasthenia and impotency is undoubtedly produced.

When a person has taken a toxic dose, e.g., 60 grains or thereabouts, the following train of symptoms is usually produced. The patient soon becomes drowsy and falls into a deep sleep from which he cannot be roused by shouting or by external stimuli, the face is flushed and the pupils contracted. In the later stages the breathing may become stertorous, and the pulse weak and irregular; the blood pressure is often high; the body surface is cold and sometimes a drenching sweat may occur. We have not met with any instance where excessive doses caused vomiting and diarrhoea. The deep sleep may end in coma and death.

Physical effects.—The habitué is usually a shallow, thin, spare and anæmic looking individual; the conjunctivæ may be congested and sometimes have a yellowish tinge. He looks sad and melancholic, especially if he has resorted to the abuse of the drug for a

considerable period. The eyes look sleepy. There is more or less loss of appetite, the breath is offensive and the tongue is coated. The habitués are very often dull, and the judgment and memory are impaired. In some cases there is a general sense of asthenia all over the body and there is a disinclination to make any physical exertion. The heart is often involved, and some of our patients complained of a sinking feeling in the chest and of palpitations. The addicts are susceptible to respiratory catarrh with signs of impaired respiratory function. The prolonged use of large doses leads to chronic congestion of the liver and lungs and to fatty degeneration of the heart. Two of our patients complained of formication over the arms, which was relieved by pressure. We have not come across any case of facial paralysis as described by Lewin, or of involvement of any cranial or other nerves. We have not met with any cases of tremors of the hands or head or of dementia. This may be due to the fact that the addiction is of recent origin in this country and that these are the effects produced after prolonged use of the drug. The drug certainly affects the higher psychological centres and the chloralist becomes a weakling; he shrinks from responsibility and becomes unreliable.

Chloral habit and other drug habits.—Addiction to opium, cocaine and chloral hydrate in India differ a great deal from each other as regards the causative factors and effects. The senior author (1928) has shown that the opium habit in this country is common among persons of a quiet disposition who need relief from some ailment or from the worry, strain and stress of life. It is generally met with in persons in the fourth decade of life or later. It is an addiction more of rural areas in northern India, although lately a new type of young addict is to be met with in the cities. It has also been shown (1931) that the cocaine habit occurs among people of licentious type who are in search of enjoyment, and need constant excitement and sexual pleasure. It is mainly an addiction of young adults and is rarely met with after the fourth decade of life. Alcohol addiction may occur at any age but the age at which the incidence is highest is between 25 and 45 years. Addicts come from all classes and vocations of life, and belong to both rural and urban areas. The chloral habit is generally a secondary addiction and occurs among those addicted to alcohol or opium. It is common in the third and fourth decades of life.

With regard to the dose, the increase in the case of chloral hydrate is not so rapid as in the case of opium and cocaine, probably because tolerance with the former drug is not developed and the toxic limit is reached very quickly. In our series of cases we did not find any of the habitués showing a passionate craving for this drug as is the case with opium and cocaine.

Chloral hydrate never gives rise to a feeling of euphoria or takes the place of a normal excitant. It never produces any agreeable reveries, as are experienced after the use of hemp drugs. Chloral is said to produce its harm by causing inaccuracy of mental judgment, and even delusions have been reported. So far as the effects on the system are concerned, chloral hydrate is by far the most dangerous of all the drugs of addiction, in that it is liable to produce serious effects on the important organs and death from paralysis of the heart.

Paraldehyde habit.—The habitual use of paraldehyde has also been recorded by Lewin and according to him is confined to persons who are inclined to take narcotics. This drug habit is very uncommon in this country, although cases have been recorded among medical men and compounders working in dispensaries. There is a case on record of a compounder who used to drink paraldehyde regularly wherever he was employed. The habit continued for six years and he finally died of severe anæmia and general dropsy. This case was seen by one of us, the symptoms and effects produced by the drug appeared to be very much like those produced by chloral hydrate. Another case was that of a sub-assistant surgeon who was quite a successful practitioner, and who took the drug for 3 to 4 years regularly and finally died of pneumonia.

Summary and discussion

1. The addiction to chloral hydrate is of recent origin. Although the occasional use of chloral as a substitute for alcohol is known in almost all the districts of the Punjab where the percentage of the Sikh population is high, addiction to this drug is confined, at present, to a very limited area in the central districts of the Punjab (Ludhiana, Ferozepore). The addicts are mostly between the ages of 21 and 40 years, and in the majority of cases are also addicted to alcohol or opium.

2. Addiction to chloral hydrate in India differs from that in Europe and America in that in the latter countries it is the physician who is responsible for producing the habit, whereas in India the habitual use of this drug is mainly among liquor drinkers who want its intoxicating effects. They start by putting it in their potion to strengthen the effects of the drink, and in this way obtain intoxication at a small cost. Among a number of them a permanent habit is established, and they become addicts.

3. The effects produced by chloral hydrate differ from those of other drugs of addiction, such as alcohol and cocaine, in that there is no preliminary stage of stimulation and excitement; the pleasurable or euphoric effects, therefore, resulting from the use of the drug are

entirely absent. It depresses from the beginning, and narcosis and deep sleep are produced by comparatively small doses. If narcosis is not produced the habitué becomes miserable, irritable, and resorts to larger doses which may be repeated.

4. The modes of administration of the drug, the etiology of the addiction, the age at which the habit is started, its duration and the objective and subjective symptoms produced, as determined by a study of 40 cases, are described.

5. The habit is harmful and dangerous. It is more liable to produce pathological changes in the organs and immediately fatal results than any other drug of addiction used in this country.

6. The mental, moral and physical degeneration produced by this addiction are more pronounced than with the common drugs of addiction in India.

7. The drug is cheap and is easily procurable, there is no control over the sale of this drug in India at the present time. These factors are largely responsible for the spread of its use amongst the masses in those localities.

8. Habitual use of paraldehyde is known in this country, but it is very uncommon.

9. There is a danger of the use of chloral hydrate for adulteration of alcoholic beverages being extended and of the further spread of the chloral habit. The practitioners of indigenous medicine and the itinerant quacks are beginning to prescribe the drug.

In conclusion, I would like to quote Louis Lewin's remarks about this class of drug. He says, 'There is no hypnotic whose use is harmless, and medical men should take this to heart in order to prevent the increase of the already widespread evil of soporific consumption'. The authorities in this country can do much to help in this direction by bringing the sale of such drugs as chloral hydrate, butyl chloral, paraldehyde, sulphonal, bromural, etc., under a more strict control. At present any one can buy these drugs and this has led to an abuse.

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CHOLERA AND CHOLERA-LIKE VIBRIOPHAGES*

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IN a previous communication (Pasricha, deMonte and Gupta, 1932¹) we reported the isolation of two new types of cholera-phage—types D and E—and suggested the existence of a sixth type—type F. Cholera-phage type D was described in that paper. The characters of the fifth type of cholera-phage—type E—are outlined below.

Source and isolation of cholera-phage type E.—This type of cholera-phage was isolated from a mixture of nearly five hundred filtrates of cholera stools and water samples collected in 1931. This filtrate was found to lyse the secondary cultures which developed after the action of cholera-phage types A, B, C and D on the cholera vibrio. Owing to the very limited virulence possessed by type E for ultra-pure smooth cholera vibrios, we experienced great difficulty in obtaining this type in pure form. It was only after several serial passages on an ultra-pure rough vibrio (on which type A cholera-phage cannot be propagated) that we were able to separate it from the contaminating type A cholera-phage.

Characters of type E cholera-phage.—This type of cholera-phage possesses reciprocal action similar to the other four types. It can lyse the secondary growths of vibrios resistant to the other types of cholera-phage and the secondary growth which develops after the action of type E on cholera vibrios is lysed by the other four types of cholera-phage (see Figs. 1 and 2). Type E cholera-phage, as first

Fig. 1.

Cross test showing the reciprocal action of cholera-phage type E.

	Secondary culture.				
	A	B	C	D	E
A		○	○	○	○
B	○		○	○	○
C	○	○		○	○
D	○	○	○		○
E	○	○	○	○	

isolated, possessed very limited virulence for ultra-pure smooth cholera vibrios. Of the fifty

* The nomenclature suggested in the editorial of this number has been used in this article.—EDITOR, I. M. G.

strains of cholera vibrios tested only four, or eight per cent., were lysed by our new type E. By a process of adaptation of type E to the strains which were not lysable by it, we obtained an E phage capable of attacking a greater number of strains. There are several 'kinds' of type E just as there are several kinds of type A cholera-phage (Asheshov, 1931). The secondary cultures that develop after the

Fig. 2.

Morison's test (Morison, 1931) as modified to include types D and E cholera-phage.

	-A BCDE	-B ACDE	-C ABDE	-D ABCE	-E ABCD
A	○				
B		○			
C			○		
D				○	
E					○

action of type A on ultra-pure smooth cholera strains are lysed by type E although the original strains were resistant to type E. The secondary cultures that develop after the action of types B, C and D, either separately or combined, on strains originally not lysable by type E are not lysable by type E. Unlike types B, C and D, type E does not lyse any strain of our non-agglutinating vibrios. The virulence of type E is restricted, like that of type A, to agglutinating cholera vibrios. It acts best on rough strains and gives complete lysis in about three hours and this lysis is well maintained for about seventy-two hours. No other type of cholera-phage gave such a complete lysis and maintained it for so long. The secondary growth that develops after the action of type E is very poor and takes some time to grow. On solid media type E cholera-phage gives rise to clear-cut areas of phage action with no undermining of the edges.

The virulence of type E cholera-phage can be easily enhanced and after a few passages on the cholera vibrio this type becomes stable. The addition of this fifth type of cholera-phage to the other four types improves the resulting cholera-phage for therapeutic purposes. It is important that strains of vibrios known to be lysable by type E be used and that type E be added about two hours before the other types, to the cultures of vibrios. Other strains of vibrios are added at the time of the second inoculation.

Cholera-phage type F.—The secondary cultures that developed after the action of cholera-phage types A, B, C and D on cholera vibrio were found to be lysable by a bacteriophage

grown on a cholera-like vibrio (vibrio 615). This we have called type F.

Cholera-like vibriophages

In addition to these pure-line types of choleraphages that lyse cholera vibrios and some of the cholera-like vibrios, we have isolated eight races of bacteriophage active against certain strains of vibrios that are not agglutinable by cholera high-titre serum and are not lysable by choleraphage. Some of the changes that occur in such a vibrio under the influence of cholera-like phages are reported below, and some experiments are recorded showing the nature of these cholera-like vibriophages.

As a preliminary to the study of cholera-like vibriophages, we classified our collection of vibrios according to their agglutinability by cholera high-titre serum and their lysability by choleraphage. The vibrios were divided into two main groups according to the source of isolation and each group into seven classes. In each group is given the total examined and in each class the percentage belonging to that class.

Group I. Vibrios isolated from clinical cholera cases (300 recently isolated strains examined).

A. Agglutinable by cholera high-titre serum. (86 per cent.).

Class 1. Lysable by type A and by types B, C and D and about 8 per cent. lysable by type E.

Sub-classes according to the various 'kinds' of choleraphage type A and kinds of type E.

Class 2. Not lysable by type A. Lysable by types B, C, D and E.

Class 3. Not lysable by type A. Lysable by two or three types of choleraphage.

B. Not agglutinable by cholera high titre serum. (14 per cent.).

Class 4. Not lysable by type A. Lysable by types B, C and D.

Class 5. Not lysable by type A, but lysable by two types of choleraphage.

Class 6. Not lysable by type A, lysable by only one type of choleraphage.

Class 7. Not lysable by any type of choleraphage.

Group II. Vibrios isolated from water and other sources such as the stools of people not suffering from cholera.—

A. Agglutinable by cholera high-titre serum.

Class 1. Lysable by type A, and by types B, C and D (one such strain isolated from 880 samples of water examined in Calcutta).

Class 2: Not lysable by type A. Lysable by types B, C and D. (Two such strains isolated from 880 samples of water examined in Calcutta).

Class 3. Not lysable by type A. Lysable by one or two types of choleraphage. (None isolated).

B. Not agglutinable by cholera high-titre serum. (100 strains examined).

Class 4. Not lysable by type A. Lysable by types B, C and D. (10 per cent.).

Class 5. Not lysable by type A. Lysable by two types of choleraphage. (24 per cent.).

Class 6. Not lysable by type A. Lysable by one type of choleraphage. (20 per cent.).

Class 7. Not lysable by any type of choleraphage. (46 per cent.).

The chief facts to be noted are :—

1. The above classification is undoubtedly a very arbitrary one but it helps to visualize the changes undergone by a vibrio. By a process of selective growth brought about by general environmental conditions, such as the quantity and quality of food, etc., or under the influence of agents such as bacteriophages, marked changes can take place in the characters of a vibrio. A non-agglutinating vibrio can become agglutinating and a phage-sensitive vibrio become phage-resistant. Such changes as 'spontaneous development of agglutinability' have been described in the literature, bearing on the subject of mutation of the cholera vibrio and much confusion has resulted. These changes are due to the adaptation occurring in the vibrio under the influence of its surroundings.

The division into two groups according to the source of isolation of the vibrio is also a very arbitrary one. There are very few true water vibrios, i.e., vibrios bearing no relationship to cholera vibrio.

2. Although a large percentage of vibrios isolated from the stools of cholera patients are lysable by choleraphage, a certain number (10 per cent.) are not lysable by any of the known types of choleraphage. A number of vibrios isolated from the river and tank waters in Calcutta are lysable by choleraphage types B, C and D.

3. Vibrios that are agglutinable by cholera high-titre serum are very rarely isolated from waters. We found such vibrios in only three samples out of the 880 waters examined by us in Calcutta. This was probably due to a recent contamination of the water with cholera material. Either the cholera vibrio dies out under natural conditions or it loses its agglutinability in its sojourn in natural waters. We have already shown (Pasricha, deMonte and Gupta, 1932²) that the latter is probably the true explanation.

4. Choleraphage types A and E cause lysis only of agglutinating cholera vibrios; and choleraphage types B, C and D in addition lyse some strains of non-agglutinating vibrios.

5. We have not isolated a vibrio that is agglutinable by cholera high-titre serum, and is not lysable by one or more types of choleraphage. Over two thousand strains of vibrios isolated in Calcutta have been examined.

6. We have isolated on many occasions from undoubted cholera cases, vibrios that are not agglutinable by cholera high-titre serum and are not lysable by any type of choleraphage so far isolated. The relative proportion of such vibrios varies with the time of the year

and the activity of cholera. Similar vibrios are frequently isolated from waters. These form class 7 of each group.

A search was made for bacteriophages active against vibrios that were not agglutinable by cholera high-titre serum and were not lysable by choleraphage.

Bacteriophages were obtained from filtrates of water samples that were active against the following strains:—

- Vibrio 57 isolated from a cholera case in 1929.
- Vibrio 615 isolated from a cholera case in 1930.
- Vibrio 1321/1 isolated from a cholera case in 1932.
- Vibrio 1434/1 isolated from a cholera case in 1932.
- Vibrio 1487 isolated from a cholera case in 1932.
- Vibrio 1512 received from Dr. Asheshov, Patna, his No. 3101 isolated by him in Puri in 1931.
- Vibrio 821/2 isolated from College Square tank water in 1931.
- Vibrio 827 isolated from College Square tank water in 1931.
- Vibrio 833/5 isolated from Hooghly river water in 1932.

Several serial passages on the particular strains, with plaque isolations were performed to ensure the resulting phages being in pure form. The original filtrate from which these phages were isolated contained only type A choleraphage. We could not demonstrate the presence of choleraphage types B, C or D in the original filtrate even after several passages on cholera vibrio.

Five of these cholera-like vibriophages (57, 615, 1434/1, 1487, 1512) after more than twenty-six daily passages on their respective vibrios were found to lyse the cholera vibrio and on cross testing for the type of choleraphage showed the presence of the following types:—

Type C alone in phage grown on vibrios 1434 and 1487.

Types B and D in phage grown on vibrio 57.

Types B, C and D in phage grown on vibrio 1512.

Types C and F in phage grown on vibrio 615.

The experiment was repeated using vibrio 57 and another filtrate. The original filtrate contained a phage acting on vibrio 57 and choleraphage type A only. After six passages of this filtrate on vibrio 57 it was found to contain choleraphage types B and D.

The results of these experiments appear to us to be very important in the study of vibrios and vibriophages, and two possible explanations occur to us.

1. That these vibrios are secondary cultures of the true cholera vibrio and have growing with them choleraphages type C or types B, C and D and that the symbiosis of the vibrio and the phage is of such a nature that the usual tests fail to demonstrate the existence of the contaminating phage. The destructive action of another powerful bacteriophage is required to liberate the choleraphage growing in symbiosis with them.

2. That the bacteriophages present in Nature are mutation forms (as distinct from adapted forms) of choleraphage types B, C and D and that under certain conditions they tend to revert to choleraphages.

We tried several experiments to demonstrate the presence of any contaminating choleraphage in cultures of these vibrios but failed to do so. Choleraphage type A can be frequently found in waters in endemic areas of cholera and is the most stable type of choleraphage. Types B and C choleraphage are rarely isolated and an explanation was put forward (Pasricha, deMonte and Gupta, 1931) for this comparative absence of types B and C as being due to either their death or the want of a sufficiently delicate technique to demonstrate their presence. From our experimental work it appears to us that the second of these explanations is the correct one. Choleraphage types B, C and D soon after passage from the human body change their characteristics under natural conditions. A mutation takes place in these three types of choleraphage.

The cholera-like vibriophages grown on vibrios 1321/2, 821/2, 827 and 833/5 (vibrios that are not agglutinable by cholera high-titre serum and are not lysable by choleraphage) do not lyse the cholera vibrio. They are distinct phages possessing very limited virulence. They induce a very remarkable change in the vibrio on which they have been propagated. The details of the bacteriophage grown on vibrio 1321/2 are given below.

Vibrio 1321/2, a non-agglutinating vibrio, isolated in April 1932 from a clinical case of cholera is lysable by a bacteriophage isolated from water. The secondary culture that develops after the action of this bacteriophage is lysable by choleraphage types B, C and D and is agglutinable almost to the full titre of cholera high-titre serum. The change is represented in the following figure.

Fig. 3.

The exact representation of an experiment showing the changes in a cholera-like vibrio under the influence of bacteriophage.

		1321/2 (NAG)	Secondary culture of 1321/2 after the action of cholera-like phage grown on 1321/2. (Agglutinable).
Choleraphage types.	A		
	B		○
	C		○
	D		○
Cholera-like phage grown on 1321/2.		○	

Similar changes were brought about by the cholera-like phages grown on the other vibrios.

Summary

1. Characters of the fifth type of cholera-phage—type E—which possesses reciprocal action similar to the other four types of cholera-phage are described.

2. The presence of a sixth type of cholera-phage—type F—is reported.

3. A classification of vibrios isolated from cholera material and from other sources according to their lysability by pure-line cholera-phages is suggested.

4. Evidence is presented to suggest that cholera-phage types B, C and D undergo a mutation in Nature and that by appropriate methods of growth their presence may be demonstrated.

5. A preliminary study of cholera-like vibriophages and their importance in the natural history of the cholera vibrio is recorded.

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PLASMOCHIN AS A MALARIAL GAMETOCIDE

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It is needless to describe the chemical nature of the drug here and the literature on the subject of the treatment of malaria by the use of plasmochin is now too extensive to refer to in detail. The observations made by others may be summarised as follows:—

(1) It has a destructive action on the trophozoites of *P. vivax* and *P. malariae*.

(2) It has no such action on the trophozoites of *P. falciparum*.

(3) With daily doses of 0.06 gramme toxic symptoms may appear, but a dose of 0.04 gramme per day with 20 grains of quinine is the least toxic but most effective treatment. In doses of 0.01 gramme per day for 6 days it can clear out all crescents.

(4) It has a preventive action in the prospective host.

(5) It has a destructive action on the gametocytes of all the three species of malaria parasites.

(6) It can prevent the development of gametocytes in man.

(7) It can so affect the gametocytes that, although not apparently destroyed, they are incapable of development into oöcysts or sporozoites in the efficient mosquito hosts.

On the last-mentioned point (7) several workers have made observations in America and in the Federated Malay States, and the writers of the present article have specially observed the action of small doses of plasmochin on the gametocytes to find out if it can prevent the developmental cycle in the mosquitoes of Bengal. This they consider as very important from the malaria prevention point of view.

Hence in order to find out how much reliance can be put on plasmochin to devitalize or sterilize the malaria gametocytes in man and thus prevent infection in mosquito, experiments were made by the authors by feeding mosquitoes on malaria cases with gametocytes in the peripheral blood. The following six species, namely, *A. stephensi*, *A. varuna*, *A. fuliginosus*, *A. ludlowii*, *A. maculatus* and *A. maculatus* var. *willmori* were used during the experiments.

The mosquitoes experimented with were all bred out in the Malaria Research Laboratory of the Bengal Public Health Department. The specimens of *maculatus* and *willmori* were hatched out from larvæ collected from Kalimpong and Sikkim. The imagines after being hatched out were kept in cages provided with water and raisins for a period of 3 to 4 days. It was found necessary to keep the newly-hatched mosquitoes in cages for at least 48 to 72 hours before feeding them on patients because they generally refused to take blood before this period. For feeding on patients they were taken out in glass jars to the malaria outdoor treatment centre.

The malaria patients who were selected for feeding purposes were picked out from the cases coming to the outdoor treatment centres at Bandel and Singur in the Hooghly district. Patients come to these centres twice a week. On the first day of attendance the blood of the selected patient was taken in thin films for examination and he was given a placebo of coloured water only. As a rule 100 microscopic fields were examined in each slide. Only those cases which showed 8 to 12 gametocytes per 100 fields were chosen for the feeding experiments.

When the selected patient attends for the second time, i.e., on the 4th day, the mosquitoes were brought in wide-mouthed glass jars and were put on the pit of the stomach of the patient for about 20 minutes. This batch

of mosquitoes were labelled as 'fed before the administration of plasmochin'. Another blood film was taken on this day for examination and counting of the parasites. After this feed the patient was given plasmochin only for 3 days with a dosage of 0.02 gramme per day per adult. A daily dose of 0.01 gramme was usually given to a child of 12 years and under.

On the 8th day, i.e., when the patient attended for the third time, the blood of the patient was again examined and a batch of mosquitoes were fed which were labelled as 'after plasmochin'. After the feed the above two batches of mosquitoes—one that fed on the 4th day before the administration of plasmochin and the second that fed on the 8th day, i.e., after the administration of plasmochin—were transferred to separate cages provided with water and raisins. They were kept at the ordinary

development of parasites within the mosquitoes. On the 8th day, that is, after 3 days' administration of plasmochin he was given treatment with quinine and arsenic as usual, with or without plasmochin.

The table below shows the results with *P. falciparum*. In this group of malignant tertian patients, 9 out of 17 cases became free of parasites in all stages after the administration of plasmochin only. The remaining 8 showed rings and crescents although reduced in number. On the patients of this group *A. fuliginosus*, *varuna*, *stephensi*, *ludlowii*, *maculatus* and *willmori* were fed before the administration of plasmochin. Those which survived were dissected with the results stated below. Similarly a batch of mosquitoes of species *A. fuliginosus*, *varuna*, *stephensi*, *ludlowii*, *maculatus* and *willmori* were fed after the administration of plasmochin.

BEFORE PLASMOCHIN						AFTER PLASMOCHIN					
Fed	Survived and dissected	INFECTION				Fed	Survived and dissected	INFECTION			
		Gland	Stomach	Total	Percentage			Gland	Stomach	Total	Percentage
89	62	10	5	15	24.2	<i>A. fuliginosus</i> ..	89	58	0	0	0
83	65	2	1	3	4.6	<i>A. varuna</i> ..	54	33	0	0	0
126	110	13	10	23	20.9	<i>A. stephensi</i> ..	74	52	0	0	0
33	24	5	3	7	29.0	<i>A. ludlowii</i> ..	19	13	0	0	0
5	3	1	0	1	33.0	<i>A. maculatus</i> ..	4	2	0	0	0
23	17	1	2	3	17.6	<i>A. willmori</i> ..	9	5	0	0	0

laboratory room temperature for 12 to 15 days after which those which survived were dissected and the results noted.

The whole of these observations were made during the period from March 1931 to February 1932. The writers were handicapped in the matter of selection of patients by the fact that they were all outdoor patients attending only twice a week and most of them failing to come regularly. There was absolutely no control over these patients.

Observations were made on all three types of parasites. Only thin films were used for the examination of the blood, which was done once on the first day, then on the fourth day, and again on the eighth day.

A placebo of coloured water was invariably given to such patients for the first three days to prevent any possible action on the parasites. Simple drugs such as diaphoretic mixtures have been noticed to influence the number of parasites. On the 4th day when the patient comes again to the centre, he is given only 3 doses of plasmochin to be taken in 3 days. The dose was determined according to the age calculated on the basis of 0.02 gramme per adult per day. This was to find out if this small dose is effective in checking the

None of the mosquitoes fed after the administration of plasmochin were infected with *P. falciparum*, whereas all the species which were fed before plasmochin got the infection in varying percentages.

Similar observations were made in 17 cases of *P. vivax* infection. Without any exception the patients in this group, unlike those in the malignant tertian group, became free from parasites after 3 days' administration of small doses of plasmochin only. Anophelines of species *A. fuliginosus*, *varuna*, *stephensi*, and *ludlowii* were fed on these patients both before and after the administration of plasmochin and the results of the dissections were noted as shown below (first table on p. 492).

The mosquitoes which were fed after plasmochin did not take the infection, whereas all the species except *ludlowii* developed benign tertian malaria parasites when fed before the administration of plasmochin. The number of *ludlowii* experimented with was very small in this group.

In 7 out of the 9 *P. malariae* cases both trophozoites and gametocytes disappeared after the administration of plasmochin for 3 days. In 2 cases trophozoites only persisted for 3 days though they disappeared subsequently on

BEFORE PLASMOCHIN						Species of mosquito experimented with	AFTER PLASMOCHIN					
Fed	Survived and dissected	INFECTION					Fed	Survived and dissected	INFECTION			
		Gland	Stomach	Total	Percentage				Gland	Stomach	Total	Percentage
113	83	12	5	17	20.5	<i>A. fuliginosus</i> ..	84	59	0	0	0	0
67	48	1	0	1	2.0	<i>A. varuna</i> ..	71	49	0	0	0	0
151	130	12	9	21	16.1	<i>A. stephensi</i> ..	92	63	0	0	0	0
6	3	0	0	0	0.0	<i>A. ludlowii</i> ..	3	2	0	0	0	0

the 10th day of our record. Anophelines of species *A. fuliginosus*, *varuna* and *stephensi* were fed on these patients both before and after the administration of plasmochin in similar doses. The after-plasmochin mosquitoes were all negative whereas the before-plasmochin ones got quartan infection in varying percentages as follows :—

Table I shows the results put together. It shows that experimentally under the same conditions malaria parasites developed in 26 per cent. of *A. ludlowii* mosquitoes, in 19 per cent. of *A. stephensi*, in 20.4 per cent. of *A. fuliginosus*, in 33.3 per cent. of *A. maculatus*, in 17.6 per cent. of *A. willmori*, and in only 3.2 per cent. of *A. varuna*. This shows that

BEFORE PLASMOCHIN						Species experi- mented with	AFTER PLASMOCHIN					
Fed	Survived and dissected	INFECTION					Fed	Survived and dissected	INFECTION			
		Gland	Stomach	Total	Percentage				Gland	Stomach	Total	Percentage
72	51	2	6	8	15.7	<i>A. fuliginosus</i> ..	63	45	0	0	0	0
54	44	1	0	1	2.3	<i>A. varuna</i> ..	51	38	0	0	0	0
46	39	2	7	9	23.1	<i>A. stephensi</i> ..	37	30	0	0	0	0

TABLE I

March 1931—February 1932

	BEFORE PLASMOCHIN							
	Total number of mosquitoes fed on malaria patients	Numbers surviving and dissected after 12—15 days	RESULTS					
			Gland infection		Gut infection		Total infection	
			Number	Per cent.	Number	Per cent.	Number	Per cent.
<i>A. ludlowii</i> ..	39	27	5	18.5	3	11.1	7	26.0
<i>A. stephensi</i> ..	323	279	27	9.7	26	8.6	53	19.0
<i>A. fuliginosus</i> ..	274	196	24	11.8	16	7.9	40	20.4
<i>A. varuna</i> ..	204	157	4	2.5	1	0.6	5	3.2
<i>A. maculatus</i> ..	5	3	1	33.3	0	0.0	1	33.3
<i>A. maculatus</i> var. <i>willmori</i> .	23	17	1	5.8	2	11.7	3	17.6
Total (average) ..	868	679	62	9.0	48	6.7	109	16.0

TABLE I—*concl'd*

AFTER PLASMOCHIN								
	Total number of mosquitoes fed on malaria patients	Number surviving and dissected after 12—15 days	RESULTS					
			Gland infection		Gut infection		Total infection	
			Number	Percent.	Number	Percent.	Number	Percent.
<i>A. ludlowii</i> ..	22	15	0	0.0	0	0.0	0	0.0
<i>A. stephensi</i> ..	205	145	0	0.0	0	0.0	0	0.0
<i>A. fuliginosus</i> ..	236	162	0	0.0	0	0.0	0	0.0
<i>A. varuna</i> ..	176	120	0	0.0	0	0.0	0	0.0
<i>A. maculatus</i> ..	4	2	0	0.0	0	0.0	0	0.0
<i>A. maculatus</i> var. <i>willmori</i> .	9	5	0	0.0	0	0.0	0	0.0
Total (average) ..	662	456	0	0.0	0	0.0	0	0.0

A. varuna is a very feeble potential carrier in comparison with the other species of mosquitoes. The percentage of infection in the total of all mosquitoes fed before plasmochin was 16 against nil amongst those fed after the administration of plasmochin. It is seen therefore that even a small dose of 0.02 gramme per day per adult for three days even without quinine will render the parasites incapable of further development in the insect host.

A. varuna were successful in taking infection when the crescent count was above 20 per 100 fields, except in case No. 3101 which showed 101 crescents. But no conclusion can be drawn as the number of observations in this particular case was very small.

Conclusions

(1) Plasmochin even in small doses of 0.02 gramme per day per adult for 3 days without the aid of quinine can reduce the number of malaria parasites in all stages to such an extent that they are not detectable in 77 per cent. of cases in 100 microscopic fields of an ordinary thin film.

(2) It is particularly useful in *P. vivax* and *P. malariae* infections.

(3) In cases of *P. falciparum* infections about 50 per cent. of the cases show parasites in the ring stage and crescents even after the above-mentioned dose.

(4) It can prevent development of malaria parasites in transmitting species of anopheline mosquitoes.

(5) It is therefore a very valuable drug for devitalizing the gametocytes in a community and should be used in all anti-malaria operations which should aim at the reduction of gametocytes. The cost will be balanced by the fact that a very small dose can prevent the parasites from developing in mosquitoes.

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MALARIA IN MINGALADON CANTONMENT, BURMA

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MINGALADON Cantonment is situated twelve miles north of Rangoon and 32 miles from the sea coast. Before this cantonment came into existence this area was thick jungle and even up till now the area which is not covered with buildings, etc., is covered with scrub jungle. The ground surface is very uneven, interrupted here and there by small nullahs and depressions, which dry up in the non-rainy season but fill up in the rainy weather. The surface slopes irregularly to the east, to a low flat plain, while towards the north and west it merges into an area of small hills covered with jungle which extends a considerable distance. Most of this area is drained by small nullahs which pass through the cantonment and discharge water on to the plain towards the east. In other places which are surrounded on all sides by hills water collects and forms ponds and

small lakes. These nullahs are of two kinds :—

1. Those fed by rain water only.
2. Those which start as seepage but flow full during the rains.

The main nullah coming from the south and passing along the west belongs to the second

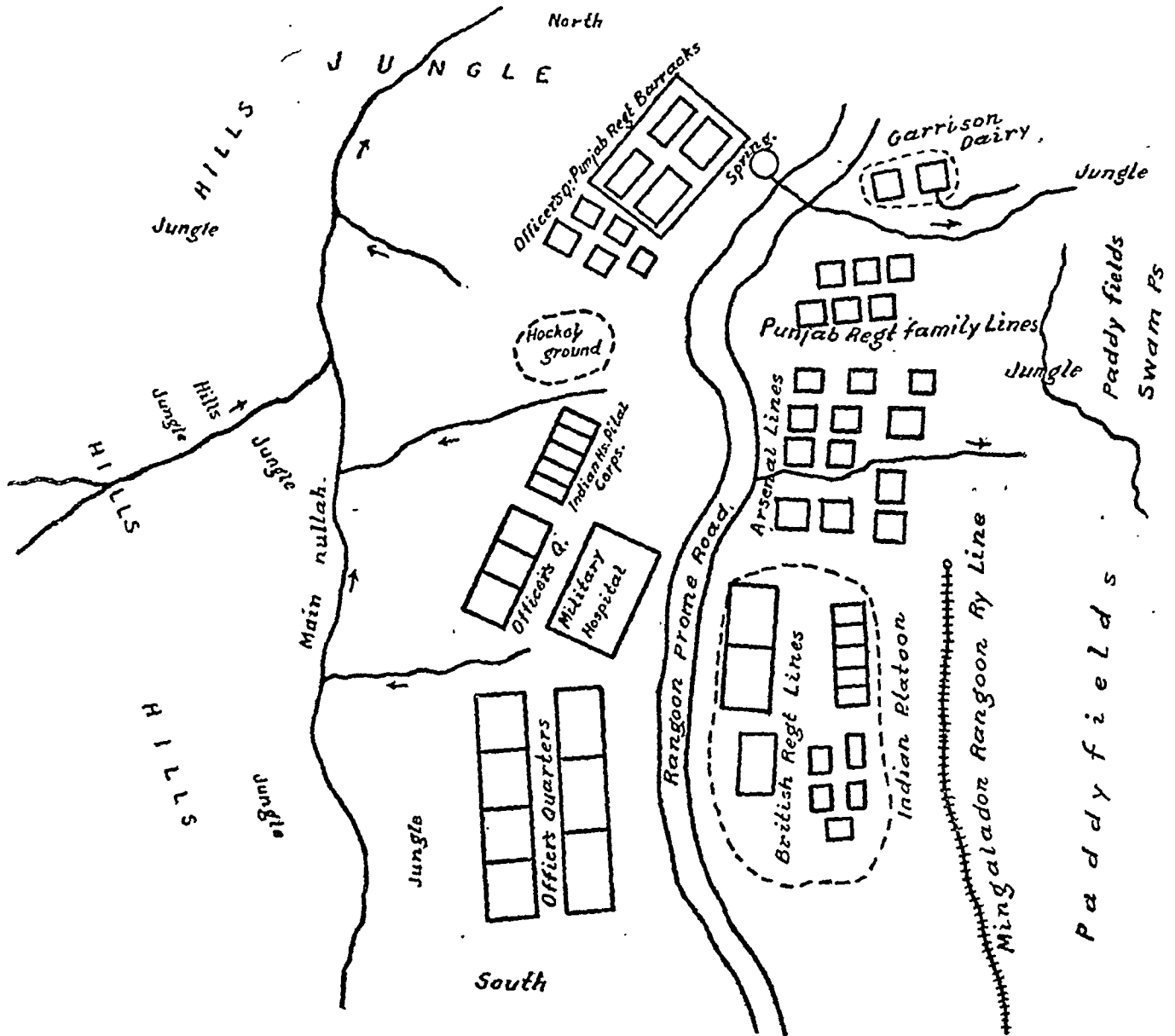
cantonment. Later on these pools are continuously flushed out by rain and there is not much mosquito breeding except in the sheltered places.

Total annual rainfall :—

1930	..	..	99.6 inches.
1931	..	..	91.85 inches.

MAP

A rough sketch showing the lay-out of Mingaladon Cantonment.



group. It stops flowing in the months of March and April but scattered pools keep on forming here and there from seepage.

Rainfall.—The rains usually set in during the second week of May and continue till the end of October or middle of November. The first few showers are followed by a break of a fortnight or so and then more or less continuous rainy weather starts. These first few showers lead to the formation of pools here and there, with the result that in a very short time they swarm with larvæ and thus there is a marked increase in the mosquito population of the

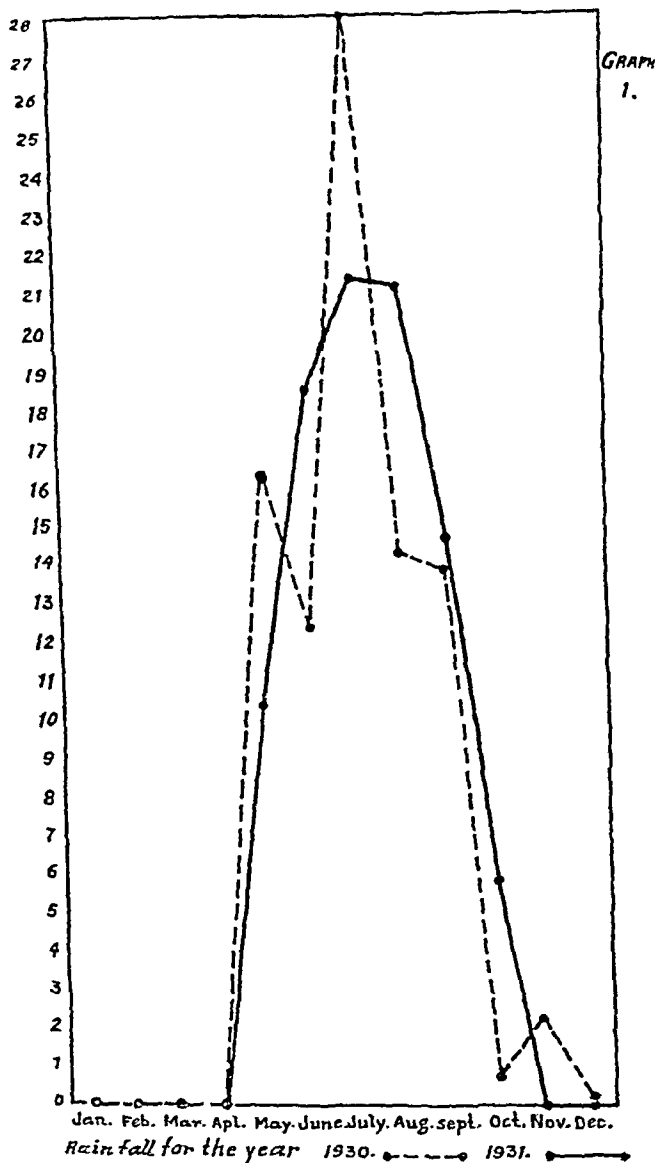
Temperature variations.—The driest and hottest months of the year are February to May and October and November. The period between June and November is the rainy weather and the temperature remains low. December and January may be called the winter months. The temperature is never above 105°F. in any part of the year but as the humidity is always high it takes a long time for the water collections to dry up.

Irrigation in adjoining lands.—There is no regular system of irrigating the lands under cultivation. The chief crop of the year is

paddy, which is grown all round the cantonment in the flat regions, and the rain water supply is enough for it.

These flat areas are converted into swamps for more than six months in the year. Overflow from these takes place into small nullahs but in some places the cultivators raise 'bunds' to form dams for storage of water.

GRAPH I



Cantonment population.—The garrison consists of one Indian infantry battalion less one company stationed in Rangoon, and one British infantry battalion less two companies—one of them stationed in Rangoon and the other at Port Blair in the Andamans. In addition there is a large arsenal with a strength of 234 men and the brigade headquarters. The civil population is mostly of the cooly class employed as labourers in the arsenal workshops and the cantonment department. Most of these men

come from malarious regions in India and as they are not permanent employees and new arrivals keep on taking the places of those who go out, the possibility of the reservoirs of infection constantly coming in remains. The total population of the cantonment is 2,823.

Prevalence of malaria.—The troops moved to this station in December 1928 and the malaria figures for the succeeding years are :—

Malaria cases

	Fresh (Local Infection).	Relapses.
1929	.. Nil	23
1930	.. 7	78
1931	.. 37	109

The station having been regarded as malaria-free till the end of 1929, a systematic investigation of the local conditions in relation to malaria was started in 1930. It was divided under the following heads :—

1. Investigation of malaria cases.
2. Anopheline fauna and vectors.
3. Reservoirs of infection.

(i) **Investigation of malaria cases.**—All patients with malaria admitted to the military hospital were questioned about their recent movements, if any, outside cantonments. Their medical history sheets were also scrutinized to find out any previous history of having suffered from malaria. In this way a number of cases who had never gone out of the cantonment and had not suffered from fever before were picked out as those who very probably had contracted the disease in the cantonment.

(ii) **Anopheline fauna and vectors.**—The regimental as well as cantonment gangs for anti-malaria work having been trained, they were asked to collect as many mosquitoes as they could from barracks, stables, cooly quarters, etc., and bring them daily to me for identification. At the same time search was made for breeding places and larvæ collected to allow breeding at the brigade laboratory. The following mosquitoes have been found present in the cantonment at different times of the year.

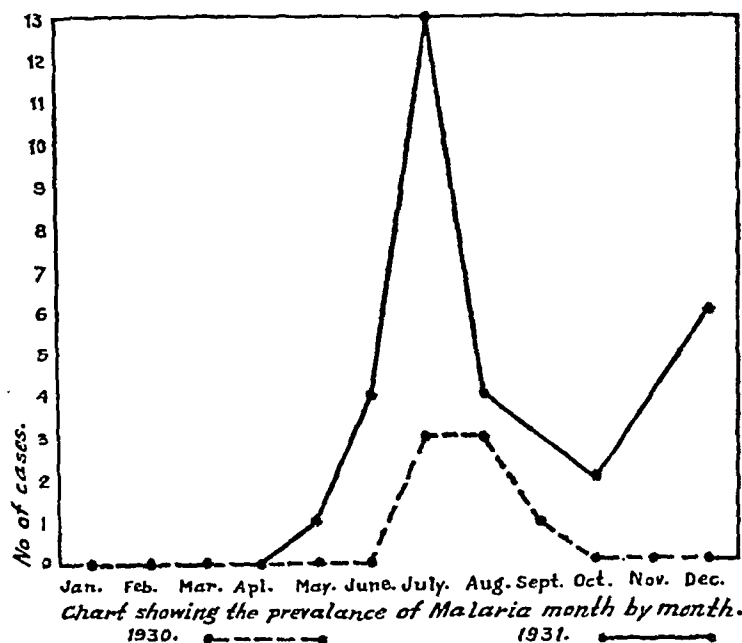
1. *A. vagus*.—This is by far the commonest mosquito in the cantonment. Its breeding places are water collections round about the houses and lines. It breeds in clear as well as dirty water and is found in the cantonment throughout the year.

2. *A. subpictus (rossii)*.—This mosquito was found only in one part of the cantonment. A search having been made for its breeding places, the small pools of dirty water in the kutchha drain coming out of the garrison dairy were found swarming with its larvæ. These pools were oiled and drainage improved, with the result that this mosquito has not been recovered from any locality since.

3. *A. maculipalpis*.—This mosquito is found in the cantonment during the dry weather. It breeds mostly in seepage water collections and disappears more or less completely during the rainy weather.

4. *A. minimus*.—This was found both during the dry and monsoon months, although the number of specimens recovered during the rains were very few as compared to those during the dry months. No males were found during the rains. It was concluded therefore that these specimens were the remnants of those that bred out before the onset of the monsoon. This mosquito was found breeding in a small nullah

GRAPH II



It is very probable that a number of these were really fresh infections.

The classification of mosquitoes was therefore undertaken along with thorough investigation of malaria cases. In a few months time more was known about the local mosquitoes and when the malaria figures started going up during the rainy weather, some fresh cases were spotted. The fact that some of these patients had not left the station and had no history of a previous attack of malaria made one thing certain and that was the presence in the lines of a vector at that particular time.

The mosquito catches from the barracks and houses during the rainy weather showed the presence of three species in order of predominance.

1. *A. hyrcanus* var. *nigerrimus*.
2. *A. barbirostris*.
3. *A. vagus*.

These three species are considered to be non-vectors of malaria but I considered one of them positively a local vector and from the evidence at my disposal accused No. 1 as the most probable one. This fact was mentioned in my annual report in September 1930. On receipt of this at Army Headquarters, my attention was drawn to the fact that in Shanghai this mosquito had been considered a non-vector for some time but ultimately proved to be the local vector. This gave support to my observation and during the rainy weather of 1931 I started dissection of this species. After dissecting twenty specimens I found one with fully developed sporozoites in its salivary glands. The dissection of 75 specimens more showed a second carrier. By this time the rainy weather had practically come to an end and these mosquitoes were getting scarce in the lines. I consider the presence of sporozoites in two specimens very strong evidence for accusing *A. hyrcanus* var. *nigerrimus* as a malaria carrier during the rainy weather.

During the dry weather, however, all the other mosquitoes mentioned above are found, but of those inhabiting the barracks *A. maculipalpis* and *A. minimus* are more important. *A. minimus* was present in quite large numbers in 1930 but the specimens became rare in 1931. I had located its breeding place (a spring near the lines) and on my suggestion a small concrete tank was made in its place, from which water is constantly drawn by the cantonment water carts for watering gardens, etc. I believe that this step has more or less eradicated the breeding of this mosquito in that area.

A. maculipalpis is the only recognised vector I have obtained from the lines since the last rainy season, and while there have been quite a number of fresh cases at the same time, there is little doubt that it is playing the rôle of carrier.

Source of infection.—It may be mentioned here that the Indian infantry battalion stationed

close to the Indian infantry lines fed by a small spring.

5. *A. hyrcanus* var. *nigerrimus*.—This appears with the onset of rains and is by far the commonest variety of anopheline found during the rainy weather. Its breeding places are water collections sheltered with long grass and other vegetation.

6. *A. barbirostris*.—This species is found at the same time as *A. hyrcanus* var. *nigerrimus*, the breeding places also being the same.

7, 8 and 9. The following species have been found during the dry weather but their breeding places have not been located.

1. *A. jamesii*.
2. *A. tessellatus*.
3. *A. pulcherrimus*.

(iii) *Malaria carrier*.—No malaria survey of the station had been done till the beginning of 1930 and therefore no vector was known. Rangoon, situated close by, is declared as 'malaria-free' by the public health authorities and, as few malaria cases occurred in Mingaladon in 1929, the presumption was that Mingaladon like Rangoon was also vector-free and that these few cases were 'relapse' cases.

here is the 2nd 15th Punjab Regiment and as these men come from the Punjab the possibility of each one of them having suffered from malaria some time or other remains. For the same reason the existence of carriers in the unit can never be denied. It is very probable, then, that these carriers were the source of infection for the Mingaladon mosquitoes when the troops moved to this place. The number of these carriers is supplemented every year by extraneous infection which is brought into the cantonment when men on furlough return from their homes in the Punjab and N. W. F.

In addition to this coolies and private followers of both battalions, including civilian servants, have also been found to suffer from malaria at times but the rôle played by them as sources of infection for the troops is very negligible.

Anti-malarial measures

1. *Individual protection*.—All ranks use mosquito nets at night and those on duty use bamber oil as a repellent.

2. *Drainage*.—The most important is the drainage of rain water in rainy weather and scattered pools in the dry season. It has been mentioned above that the ground surface of Mingaladon area and its surroundings is very uneven and water collects anywhere and everywhere to allow mosquito breeding. The cantonment being new and the area to be dealt with so extensive it is practically impossible to provide a pucca drainage system at the present stage.

Kutchra drains which are dug out are never permanent as they get filled up with mud brought down by rain water. Besides the rapid growth of grass and other vegetation in them obstructs the flow of water, providing shelter for the mosquito larvæ to breed there. A gang of civilian coolies is engaged every year to work under the direction of the Anti-Malarial Officer. Their duty is to drain every water collection into the nearest big or small nullah by making small drains and removing grass and other obstructions wherever necessary.

The mosquitoes breeding during the rains are *A. hyrcanus* var. *nigerrimus* and *A. barbirostris* and as both of them breed in places sheltered with long grass, etc., their breeding is cut down considerably if this work is efficiently carried out.

3. *Cutting down jungle*.—The ground surface of the cantonment area towards the north and west and to some extent towards the south is covered with scrub jungle. At present it is very difficult to get an idea of the land hidden by it. I consider its clearing a very important and necessary anti-malarial measure, as this step will not only expose the land to allow water collections to dry quicker but also remove the chances of so many breeding places remaining unnoticed.

The anti-malarial gang of coolies does a little of this work but its strength is so small that they cannot go very far outside the area actually covered with buildings.

4. *Oiling*.—In places where the ground surface around a water collection is too high to allow a drain to be cut through, oiling is resorted to. This measure is mostly used during the dry weather to deal with seepage collections. During the rains it is practically useless as, owing to constant rainfall, there is a constant flushing of water collections going on. This keeps the breeding of mosquitoes other than *A. hyrcanus* var. *nigerrimus* and *A. barbirostris* under check. These two species breed under shelter of grass which grows all over the cantonment during the rains. Seepage collections have to be constantly oiled and one can say that the mosquito population is kept very much under control in this way during the dry weather.

Nature's anti-malarial measures

Larvæ-eating fish.—The following varieties of these are present in Mingaladon waters.

1. Genus *Haplochilus*.—*Haplochilus panchax* is the member of this group found here. It always floats near the surface of water and lives on living larvæ. While under observation in the laboratory it was noticed that it did not touch the dead larvæ at all, nor did it touch the pupa stage.

2. Genus *Trichogaster*.—It is a pretty little fish with vertical stripes on its body. Two members of this group are present here.

(i) *Trichogaster fasciatus*.—Quite a common fish and under observation in the laboratory proved a voracious eater of larvæ. It does not as a rule float near the surface of water but comes very frequently to the top for breathing and swallows larvæ. Does not touch pupæ or dead larvæ. It was interesting to watch it taking into its mouth dead larvæ at times and immediately throwing them out again.

(ii) *Trichogaster labius*.—It is smaller in size than the *fasciatus* and the stripes have a blue colour with a little tinge of scarlet. The tips of the rays in the dorsal fin and anal fin are also scarlet in colour. In habits it resembles *T. fasciatus*.

The genus *Trichogaster* is very hardy and can live even in confinement for a very long time.

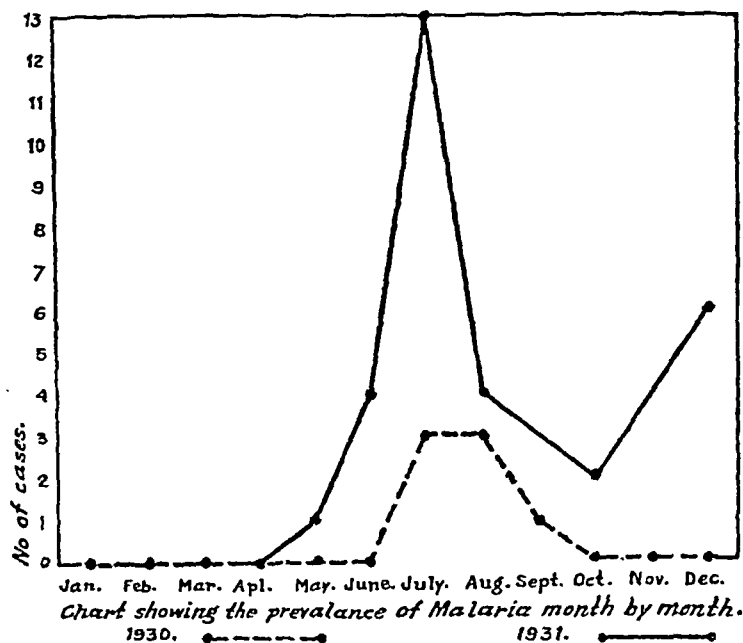
3. Genus *Badis*.—*Badis badis* is the member of this group found here. It is present in muddy waters and is very rarely seen on the surface of water. In confinement in the laboratory it was always found resting at the bottom of the container and, although eating larvæ, was never found active in feeding like the *Trichogaster*. It has a striped body too.

4. Genus *Anabus*.—*Anabus scandens* is the member of this group found here. It grows to a fairly big size and is quite common in

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Source of infection.—It may be mentioned here that the Indian infantry battalion stationed

from the abscess. It is of interest to note that this pus was found to contain a large number of eosinophile, polymorphonuclear and mononuclear leucocytes, along with a few dead and calcified guinea-worm embryos.

Natural infection with guinea-worm is known to occur in a number of different animals. These include dogs, horses, cattle, leopards, certain species of monkeys and a cobra. I have not however come across cases of infection among animals in any of the infected areas and the villagers also deny having seen their cattle infected with guinea-worm at any time. It may be as Turkhud (1919) has pointed out in his notable case of guinea-worm infestation of a cobra, that the species of guinea-worm implicated in these animals is not *Dracunculus medinensis*.

Blood condition in dracontiasis.—Hæmatological data collected so far, show that general eosinophilia is a marked feature of this disease. Blood smears of patients suffering from different stages of the diseases, i.e., (1) in the stages of urticarial syndrome, (2) at the formation of the bleb, and (3) those taken before and after the extraction of the guinea-worm, were examined. The percentage of eosinophile cells in the blood appears to be at its maximum when the bleb is just forming. In one case blood examination was made during the urticarial syndrome. The percentage of eosinophiles was 6.8. About 3 days later when the bleb had fully formed the percentage of eosinophiles was 15.3. The low percentage of eosinophiles during the stage of urticarial syndrome has been suggested by Hamilton Fairley (1924) to be 'due to the migration of the eosinophile leucocytes into areas of urticarial syndrome in the subcutaneous tissues; and the subsequent rise is probably due to the increased manufacture of eosinophiles by the hæmopoietic system under the stimulating action of the toxic substance elaborated by *D. medinensis*'.

In the same patient, an attempt was made to study the blood condition before and after the extraction of the worm. Unfortunately in an attempt to extract the worm in one sitting it snapped and hence blood examination could not be done in this case. This was however, done in another patient in whom the worm was seen coiled up under the skin. Since the worm was felt easily on the skin, an incision about 1½ inches in length was made as far as the worm after anæsthetising the part by local infiltration with novocaine solution, the entire worm being thus extracted in this case. Blood smears taken before the extraction of the worm in this case showed the percentage of eosinophiles to be 18.6 and those taken 24 hours after extraction 15.2. The blood smears examined 3 days later showed the percentage of eosinophiles to be 3.3. Blood smears of fifteen other patients in whom the worm had not been

completely extracted, were also examined. All of them showed general eosinophilia and the percentage of eosinophiles was found to vary from 8.8 to 20. But in six of those in whom the worm had been completely extracted, either by surgical interference or by the old winding method, the percentage of blood eosinophilia was only between 1.5 to 3. Secondary infection was found to be associated with a decrease in the proportion of eosinophiles and relative increase in the polymorphonuclear leucocytes. In the above seventeen cases, blood eosinophilia which might possibly be due to other intestinal helminthic infections was excluded by selecting only such patients as did not show the ova of any of the most common helminthic parasites such as hookworm, ascaris and oxyuris in their stools.

Examination of the fluid from the bleb :—this was studied in thirteen cases. On aspiration the fluid from the bleb was found to be composed of yellow serum containing live *dracunculus* larvæ in an active condition. Microscopic examination showed the presence of mononuclear, polymorphonuclear and eosinophile leucocytes. As has been shown by Moorthy (1929) in the case of the vernal catarrh of the conjunctiva, this is one other condition where blood eosinophilia is associated with the presence of eosinophile leucocytes at the seat of inflammation. This general eosinophilia in this disease is perhaps the result of the stimulating action of the helminthic toxic elaborated by *Dracunculus medinensis*, on the hæmopoietic system.

Epidemiological features of the disease.—During the course of the above investigation many interesting epidemiological features of the disease have been noticed, and with our present knowledge it is difficult to offer a satisfactory explanation for most of them. At the outset it is difficult to explain why there are only 70 guinea-worm infected villages in the whole of the Chitaldrug district though there are any number of other villages where also the drinking water supply is derived mainly from step-wells that have been infected with cyclops. In one of the villages, Siramagondanahally, in Davangers taluk, for instance, there are two step-wells, one of which is used by the caste people and the other exclusively by the Adikarnatakas. While nearly 20 to 30 per cent. of the former suffer from dracontiasis every year, there has not been a single case of this disease among the Adikarnatakas for quite a number of years. In another village, Kundayada, which is situated only about two miles from this village, the exact reverse is the case, i.e., the Adikarnatakas suffer from the disease every year, while from the information given by the villagers most of the caste people appear to be free from the disease. It has also been noticed that in the same place and in some cases even in the same family, it is only a few

that suffer from the disease every year, though all of them use the same infected step-well water. Detailed statistics collected in five infected villages (*vide* Appendix A) show that out of a total number of 544 houses the infection is practically confined to only 256 houses, dracontiasis cases occurring only in these houses every year. Even in these, which the villagers call 'guinea-worm houses', out of about 925 people living in them, only about 256 suffer from the disease every year; though all the villagers derive their drinking water supply from a common, heavily infected step-well. Unlike other diseases which sometimes confer immunity on patients when once they suffer from them, in dracontiasis it is usually the individual who has suffered once from the disease that continues to suffer from it almost every year. Statistics collected in 40 guinea-worm infected villages in Chitaldrug district show that out of a total of 1,363 patients who suffered from dracontiasis last year, 1,144 of them had suffered from it in previous years also, and only 219 patients suffered from the disease for the first time. This gives the percentage of recurring old attacks to be nearly 83 and the fresh attacks last year as about 17 per cent. What it is that increases this susceptibility to infection in an individual who has suffered from the disease once before is a matter that requires careful investigation.

Effect of hydrochloric acid on infected cyclops.—Experiments conducted so far indicate that all the different infecting species of cyclops are not killed immediately by 0.2 per cent. hydrochloric acid, *i.e.*, the percentage of hydrochloric acid that is present in the gastric juice of a normal healthy individual, and the strength of the acid needed to kill varies from 0.2 per cent. to 0.4 per cent. according as the particular cyclops experimented with belongs to one or the other species. Hydrochloric acid below 0.2 per cent. does not seem to kill any species of cyclops and in a few cases it was noticed that hydrochloric acid of strength beyond 1.0 per cent. kills the cyclops as well as the dracunculus larvæ lying inside its body cavity. It has also been noticed that in a number of instances after the addition of hydrochloric acid of strengths varying from 0.2 to 0.6 per cent. the activated guinea-worm larvæ do not always escape from the dead cyclops but remain actively moving inside the body cavity of the cyclops for a varying period of 1–4 hours and ultimately die inside the body of the cyclops after making several strenuous but futile attempts to make their way out through the hard exoskeleton of the cyclops. Out of 525 cyclops thus treated with hydrochloric acid of strengths varying from 0.2 to 0.6 per cent., in only 30 of them were the activated larvæ seen to escape from the dead cyclops; while in all the rest of the cases though the guinea-worm larvæ became very

much activated after the addition of the acid, they did not escape from the cyclops. It has been further observed that with the gradual increase in the strength of the acid from 0.6 per cent. to 1.0 per cent. the activity of the larvæ became very much diminished and at the end of a varying period of $\frac{1}{2}$ –1 hour the larvæ were found dead inside the body of the cyclops. The problem is still under investigation and it is difficult to draw any definite conclusions from these observations. However, the results so far obtained are very interesting and serve to offer an explanation for some of the clinical features of the disease stated above. These experiments seem to show, as far as artificial experiments can indicate, that in certain constitutional conditions, such as hyperchlorhydria both the cyclops and the guinea-worm larvæ are killed in the gastric juice, and in other conditions, such as hypochlorhydria or achylia gastrica, the strength of the acid in the gastric juice is not sufficient to kill the cyclops or activate the guinea-worm larvæ inside its body cavity. Thus in either condition, the dracunculus larva has hardly any chance to develop into an adult worm and hence perhaps these individuals do not develop the disease. These experiments also suggest that in any place, there can be only a few individuals in whom the percentage of hydrochloric acid in the gastric juice is just sufficient to kill the cyclops and set free the activated guinea-worm larvæ. Since the lethal dose of hydrochloric acid for cyclops varies with different species, it is likely that in a place where the step-well is infected with a species of cyclops like *C. leukarti* which is easily killed by 0.2 per cent. hydrochloric acid, *i.e.*, the percentage of hydrochloric acid in the gastric juice of a normal healthy individual, the amount of guinea-worm infection is likely to be greater than in a place where the infecting species of cyclops requires more than 0.2 per cent. hydrochloric acid to kill them. In other words the amount of infection in any place appears to depend to a certain extent on the particular infecting species of cyclops present in the place. This therefore suggests the importance of making a detailed cyclops survey of the different guinea-worm infected areas before any serious epidemiological investigations on the disease are undertaken. These experiments also suggest that when constitutional conditions remain unaltered it is naturally the same individual who has suffered from the disease once, that continues to suffer from it every year. Mass infection, maturity of the cyclops and the concentration of the hydrochloric acid in the gastric juice appear to be the factors that ensure successful infection in man, and alterations in any of these factors perhaps explain the variations in individual susceptibility.

Water analysis of the infected step-wells.—It has been noticed generally that in almost all

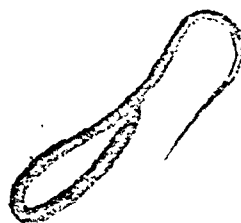
the infected places the water in the step-well is so pleasant and nice that people persist in drinking this infected water in spite of providing them with a safer and a better source of drinking water like a draw-well or a bore-well. In one place, I was surprised to get a reply from an individual that the water in the step-well was so sweet and pleasant to drink that he preferred to drink this infected water and suffer from dracontiasis once a year, rather than drink the brackish draw-well water which he considered a continuous misery. That people should take this extreme attitude indicates that the step-well water is really pleasant to drink. With a view to find out what it is that makes the water so sweet, a general chemical analysis of water from 12 infected step-wells was made in the Public Health Institute, Bangalore. It has been noticed that most of the samples of water examined were strongly alkaline to litmus and the pH value varied from 7.0 to 7.9. The pH value does not seem to have any definite relation to the degree of infection present in each of these guinea-worm infected areas. It has however been suggested by Davis (1931) that by the addition of alkali if the pH value of water is raised to about 10 then it has a definite lethal action on cyclops. The uniformly high values got for chlorine, free ammonia and albuminoid ammonia and oxygen absorbed in 2 hours show that these samples are heavily contaminated with organic and vegetable impurities. The presence of nitrates and nitrites in some samples suggests that the organic impurities are probably animal in origin. At this stage of the investigation it is, however, difficult to attribute the sweetness of the water definitely to any one of these impurities. As has already been stated, experiments show that the survival time of cyclops as well as that of the guinea-worm embryos is definitely shortened when they are isolated in brackish draw-well water. I therefore think that a more detailed chemical analysis of these different samples of water might reveal the presence of certain substances naturally present in some which inhibit the growth of cyclops and guinea-worm larvæ in them. Any such data collected will be of considerable importance since they may not only give a clue to the preventive measures that can be instituted, but incidentally may also serve to explain the prevalence of guinea-worm infection in only a few villages in the district, though there are any number of other villages which derive their drinking water supply from similar step-wells.

Biological control of dracontiasis—(a possibility).—In this connection it is of interest to note that in one village Gannanaikanahally in Chitaldrug district, about eight years ago there was a breach of the ditch situated close by and a large number of fish, most of them belonging to the genus *Barbus*, were accidentally introduced

into this step-well. Before the accident happened there was not a single fish in the well and nearly 20 to 30 per cent. of the population of this village used to suffer from dracontiasis almost every year, but since the introduction of these fish guinea-worm infection has become practically extinct in this village. The specimens of fish collected from this step-well were sent to the Indian Museum, Calcutta, where the following different species of *Barbus* were identified :—

- (1) *Barbus sophero*.
- (2) *Barbus chola*.
- (3) *Barbus amphibius*.
- (4) *Barbus puckelli*.

Taking the clue from the information given by the villagers, a few preliminary experiments were undertaken. The problem is still under investigation and from the observations that have been so far made, it has been noticed that one of the species of fish mentioned above—*Barbus puckelli*—feeds voraciously on cyclops. On account of the comparatively sluggish movements of the infected cyclops the fish appear to feed better on infected rather than on non-infected cyclops. When an emulsion of live guinea-worm larvæ was put into a basin in which this species of fish had been isolated, and the intestinal contents of the fish



Photomicrograph of guinea-worm larva found in the intestinal contents of fish—*Barbus puckelli*—(infected experimentally).

were examined 12 hours later, it was found that this species of fish easily became infected with the guinea-worm larvæ. Unlike the cyclops which are easily digested when they are taken in by the fish, the guinea-worm larvæ were found to be alive and seen actively moving in the intestinal contents of this fish. At this stage of the investigation it is difficult to say whether similar infection of the fish with guinea-worm larvæ takes place in nature. However, field observations made so far show that in heavily guinea-worm infected places, the step-well does not contain any fish. At present it is also difficult to estimate the value of this species of fish in the biological control of dracontiasis.

APPENDIX A
Detailed statistics of dracontiasis patients collected in some of the guinea-worm infected villages

No.	Name of the village	Population	Number of houses	Number of infected houses	Number of persons living in these infected houses	Number of persons who suffer from the disease every year	Number of persons who suffered from the disease only last year	Infection of the step-wells with cyclops	AGE						SITUATION OF THE WORMS				REMARKS
									2-5 years	5-15 years	15-30 years	30-50 years	Above 50 years		Lower extremity	Upper extremity	Abdomen and chest	Other rare situations	
1	Medikerpura	800	124	41	287	47	14	++	M. F.	7	22	9	5	..	52	6	3	..	Tongue case developed broncho-pneumonia and died
2	Chikkondahally	650	110	30	240	51	8	++	M. F.	5	13	13	7	2	56	2	1	..	
3	Yerabolly	985	200	36	204	53	4	++	M. F.	6	12	12	5	1	47	12	1	..	
4	Gollorhatty	500	80	34	138	52	7	++	M. F.	10	10	13	3	1	48	9	1	..	
5	Bommakanahally	150	30	8	56	15	2	++			4	1	..		14	2	1	One case on the tongue	Tongue case developed broncho-pneumonia and died
	TOTAL	3,085	544	149	925	221	35	..			61	48	20	4	217	31	7	1	

In one of the collections of cyclops the laboratory boy had brought a few mosquito larvæ also. While conducting certain feeding experiments on this fish it was accidentally noticed that this species of fish—*Barbus puckelli*—feeds on mosquito larvæ also voraciously, as do other mosquito larvicidal fish that have been described.

* * * * *

The little work I could do on this problem was in no small measure due to the ready help and able guidance given by Dr. D. A. Turkhud, Dr. J. V. Karve, Director of Health in Mysore, and Mr. L. N. Roa, Central College, Bangalore, and my grateful thanks are due to them. I must also thank Mr. D. D. Mukherjee of the Indian Museum for having kindly identified the different species of fish sent to him.

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THE PROTECTIVE VALUE OF T. A. B. INOCULATION AS INDICATED BY THE AGGLUTINATING POWER OF THE SERUM

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IN a previous paper on the 'Agglutination Reaction in Healthy Persons' we concluded that the vast majority of healthy individuals in Bihar, contrary to the prevailing belief, do not show any protective bodies as indicated by the agglutinins of the typho-coli group. We

alluded to the possible presence of non-demonstrable protective factors in the body other than agglutinins. But at present the agglutination reaction provides us with an important index for the diagnosis of such infection and for the study of protection conferred by prophylactic inoculation. The value of prophylactic T. A. B. inoculation is well understood by the naval and military forces of all countries but is hardly appreciated by the civil population in India. According to Pryor 'the mean annual death rate from typhoid fever in the U. S. Navy for the years 1900-11 was 41.2 per 100,000. Compulsory inoculation was begun in February 1912, when the death rate dropped abruptly, and the mean annual death rate for 1912-26 has been only 1.51 per 100,000'. Knorr finds that 'the incidence of typhoid fever before the war in the age periods 20-50 was approximately as high in the males as in the females of the same age and certainly not lower. In the epidemic of Pforzheim in 1919 and in less degree at Hanover in 1925, the incidence was lower among men than women of the same age. The chief reason for this was anti-typhoid inoculation'. Among the British troops in India in 1926 in the 54,439 inoculated men there were 123 cases with 7 deaths or 1 in 422 and 1 in 7,777 respectively; in the 1,486 uninoculated men there were 26 cases with 2 deaths or 1 in 57 and 1 in 743 respectively. In 1927 in the 50,132 inoculated men there were 144 cases with 6 deaths or 1 in 348 and 1 in 8,355 respectively: in the 2,053 uninoculated men there were 10 cases with 1 death, or 1 in 205 and 1 in 2,053 respectively. In 1928 in the 53,157 inoculated men there were 185 cases with 17 deaths or 1 in 287 and 1 in 3,127 respectively: in the 1,244 uninoculated men, there were 12 cases with 1 death or 1 in 104 and 1 in 1,244 respectively. Among the Indian troops in 1926 in the 135,146 men of whom 96.1 per cent. were inoculated, there were 79 cases with 8 deaths. In 1927, in the 133,082 men of whom 96.6 per cent. were inoculated there were 165 cases with 9 deaths. Among the jail population in India who are usually not inoculated, during 1926 in the 129,192 inhabitants there were 183 cases with 37 deaths; during 1927 in the 132,649 inhabitants there were 257 cases with 46 deaths. Thus the relatively lower rate of incidence of the infection and of death among the inoculated persons in comparison with those of the non-inoculated is definitely established in every country.

Opinions however differ with regard to the duration of the immunity afforded by prophylactic inoculation and the number of injections necessary to produce satisfactory protection. Harvey and Iyengar after a comprehensive study concluded that '(a) single doses of vaccine can produce immunity, but not of so high degree as two or three doses, (b) the duration

of immunity after inoculation is shorter than is generally appreciated; (c) low grade persistent agglutination titres, if definitely higher than normal serum agglutination, may be an indication of an immunity, which is rather to be reckoned as sensitiveness to re-immunization than actual protection; (d) re-immunization may be carried out with doses which are smaller than even the smallest doses originally required to confer it and is as great and lasts as long as the original immunity'. Rogers is of opinion that the protection afforded lasts for at least two or three years. Osler and McCrae consider that the duration of protection usually persists for at least three years and in some cases for a longer period. Rosenau considers that the immunity varies in degree and also in duration from one to four years; on the average, the immunity may probably be depended upon for about three years when produced by four injections of dead bacilli. Thus it may be observed that no definite rule has been laid down regarding the degree of immunity and the duration of protection after prophylactic inoculation. Without entering into the question of the relative merit of one, two or three injections, one may state that the main principle of prophylactic inoculation is to produce a high reducing titre of the serum against certain organisms. To attain that end we should be certain of the antigenic property of the vaccine employed; the rest depends on the individual tissue response. The antigenic property of a vaccine is dependent upon the virulence, number, age and strain (H-form or O-form) of the organisms and the method of preparation. The vaccines employed in the military hospitals in India are obtained from Kasauli and can be depended upon as satisfactory and constant with regard to their antigenic property. It will presently be seen that the agglutinating property of the serum after prophylactic inoculation is extremely variable and is not dependent upon the number of injections, and that immunity, as judged by the reducing titre of the serum, once satisfactorily developed, persists for a long period. It may be mentioned here that a second attack after a natural infection is found comparatively rarely owing probably to the presence of immune bodies which invariably develop in every case during the infection. After prophylactic inoculation, a fairly large number of cases contract typhoid fever. In 1929 among the troops in India, we find the percentage of cases who contracted typhoid fever within six months of inoculation or re-inoculation is high, representing 39.2 per cent. of British cases and 37.9 per cent. of Indian cases. Of the Indian cases, who contracted typhoid fever within six months of inoculation, 46 had been reinoculated (30 with 1 c.cm. dose and 16 with $\frac{1}{2}$ and 1 c.cm. doses); 18 cases occurred after primary inoculation (6 with 1 c.cm.

dose and 12 with $\frac{1}{2}$ and 1 c.cm. doses). Of 22 deaths, 15 contracted the disease after over 6 months inoculation (6 with $\frac{1}{2}$ and 1 c.cm.; 9 with 1 c.cm. dose); 7 had been inoculated within 6 months (4 with 1 c.cm. dose and 3 with $\frac{1}{2}$ and 1 c.cm. doses). Recently Afridi has pointed out that the protection is not absolute and that the combination of T. A. B. inoculation and good sensitization is essential to combat the disease. The usual explanation given for such incidence of the disease among the protected men is that the inoculation does not entirely prevent the disease; it reduces the rate of susceptibility and mortality. A rather severe case of typhoid fever in a well-known foreign medical visitor to India who had previously been protected both by the T. A. B. inoculation and Besredka's bilivaccine, prompted us to start this investigation early in 1929.

Indian troops have been selected for our observations as they live under controlled hygienic conditions and maintain a complete

medical history sheet of their previous inoculations. We have employed Dreyer's technique and followed mainly the directions of the Standards Laboratory, School of Pathology, Oxford University, issued by the Medical Research Council. Standardized agglutinable suspensions were obtained from Oxford. The samples of sera were stored in the ice chest during the interval of about 2 to 3 days between the collection and the examination. The agglutinating power of the serum has been expressed as 'reduced titre' (R. T.). When the standard agglutination occurs with standardized suspensions in a serum dilution of 1 in X, then X divided by the figure (reduction factor) given on the label of the standardized suspension employed gives the reduced titre. Thus if standard agglutination occurs in a dilution of 1 in 100 and the number on the label is 2, then the R. T. is $\frac{100}{2}$ or 50. The reduced titre is the same value that has hitherto been called "the number of standard agglutinin units per c.cm. of serum".

TABLE I

Agglutination reaction after prophylactic T. A. B. inoculation

Serial number	Case number	Previous inoculation	Last inoculation	* Approximately in months	R. T.		
					T.	A.	B.
1	40	26-9-27	28-10-28	2	0	11.3	29.6
2	28	29-6-27	20-9-26	3	36.8	28.4	29.6
3	34	29-6-27	22-7-28	5	36.8	18.8	29.6
4	29	29-6-27	18-7-28	5	12.2	18.8	17.8
5	32	29-6-27	16-7-28	5	1.8	18.8	29.6
6	31	29-6-27	15-7-28	5	36.8	28.4	29.6
7	33	29-6-27	15-7-28	5	36.8	2.8	29.6
8	30	29-6-27	14-7-28	5	12.2	18.8	29.6
9	35	29-6-27	27-6-28	6	36.8	28.4	29.6
10	23	6-6-27	15-6-28	6	0	11.3	0
11	14	30-6-27	15-6-28	6	18.4	18.8	8.9
12	15	30-6-27	15-6-28	6	0	0	0
13	17	30-6-27	15-6-28	6	18.4	11.3	17.8
14	18	30-6-27	15-6-28	6	18.4	18.8	8.9
15	19	30-6-27	15-6-28	6	7.3	28.4	17.8
16	20	30-6-27	15-6-28	6	3.6	28.4	17.8
17	21	30-6-27	15-6-28	6	12.2	2.8	29.6
18	36	30-6-27	15-6-28	6	18.4	28.4	29.6
19	11	26-1-27	13-6-28	6	0	2.8	0
		9-2-27					
20	16	30-6-27	13-6-28	6	1.8	18.8	8.9
21	26	30-6-27	13-6-28	6	0	0	0
22	22	6-6-27	13-6-28	6	0	0	29.6
23	37	12-3-27	13-6-28	6	36.8	18.8	44.6
24	39	30-12-27	16-3-28	9	36.8	5.6	29.6
25	42	18-2-27	1-3-28	10	18.4	18.8	29.6
26	41	2-3-27	27-2-28	10	7.3	2.8	29.6
27	46	21-1-27	14-2-28	10	36.8	28.4	44.6
28	38	10-1-27	10-2-28	11	12.2	18.8	44.6
29	45	10-1-27	10-2-28	11	3.6	0	8.9
30	25	1-10-24	30-12-27	12	0	0	0
31	12	4-2-27	6-1-28	12	1.8	11.3	0
32	13	18-9-25	6-1-28	12	12.2	5.6	8.9
		28-9-25					
33	3	Nil	30-12-27	12	0	0	4.4
34	1	4-2-27	26-12-27	12	18.4	2.8	8.9

* Approximate interval in months from date of inoculation and reaction.

TABLE I—*contd.*

Serial number	Case number	Previous inoculation	Last inoculation	* Approximately in months	R. T.		
					T.	A.	B.
35	7	9-5-26	31-12-27	12	3.6	11.3	8.9
36	9	20-5-26	31-12-27	12	0	0	0
37	10	2-3-26	31-12-27	12	18.4	0	0
38	24	12-3-26	26-12-27	12	18.4	5.6	0
39	8	13-11-26	10-12-27	12	7.3	11.3	17.8
40	6	17-4-26	7-12-27	12	18.4	11.3	17.8
41	44	28-4-26	27-10-27	14	36.8	28.4	29.6
42	82	1-10-27	15-2-28	14	20.1	12.5	0
43	56	8-5-26	23-12-27	15	40.3	62.5	50
44	92	29-9-25	23-12-27	15	20.1	62.5	20
45	93	8-10-25	23-12-27	15	20.1	62.5	100
46	67	11-4-25	23-12-27	15	4	20.7	20
47	91	21-4-25	23-12-27	15	40.3	12.5	100
48	50	6-2-26	21-12-27	15	8	6.2	50
49	51	29-9-25	21-12-27	15	80.6	62.5	100
50	58	8-10-25	21-12-27	15	20.1	6.2	50
51	62	29-9-25	21-12-27	15	40.3	31.3	100
52	64	8-10-25	21-12-27	15	8	31.3	50
53	65	29-9-25	21-12-27	15	8	31.3	50
54	66	8-10-25	21-12-27	15	8	12.5	20
55	55	25-7-25	21-12-27	15	40.3	62.5	100
56	57	4-8-25	21-12-27	15	4	62.5	100
57	49	12-6-25	21-12-27	15	80.6	62.5	50
58	54	8-10-25	27-7-27	20	4	12.5	50
59	68	19-12-25	27-7-27	20	0	0	0
60	69	29-12-25	27-7-27	20	0	12.5	100
61	52	29-12-25	27-7-27	20	8	6.2	50
62	60	8-10-25	27-7-27	20	20.1	0	50
63	61	29-9-25	27-7-27	20	8	20.7	50
64	63	8-10-25	27-7-27	20	20.1	31.3	50
65	94	29-9-25	27-7-27	20	40.3	62.5	50
66	47	8-10-25	27-7-27	20	80.6	62.5	5
67	89	18-5-26	27-7-27	20	0	0	0
68	84	27-9-24	22-2-27	25	0	62.5	33.2
69	81	11-4-25	24-11-26	28	13.3	12.5	50
70	74	21-4-25	21-6-26	33	20.1	20.7	50
71	83	12-10-24	24-10-25	41	0	20.7	20
72	43	Nil	17-6-28	6	3.6	5.6	8.9
73	4	Nil	26-9-27	15	0	11.3	17.8
74	5	Nil	4-10-27	15	0	1.8	8.9
75	2	Nil	26-9-27	17	0	2.8	17.8
76	27	Nil	4-10-27	17	36.8	18.8	29.6

* Approximate interval in months from date of inoculation and reaction.

TABLE I—concl'd.

Serial number	Case number	Previous inoculation	Last inoculation	* Approximately in months	R. T.		
					T.	A.	B.
77	72	Nil	29-8-27 5-9-27	18	0	0	50
78	73	Nil	29-8-27 5-9-27	18	4	20.7	100
79	70	Nil	11-7-27 18-7-27	20	0	0	100
80	71	Nil	11-7-27 18-7-27	20	0	12.5	100
81	85	11-4-25 21-4-25	8-5-26 18-5-26	34	40.3	12.5	20
82	53	Nil	29-9-25 8-10-25	41	0	0	20
83	59	Nil	29-9-25 8-10-25	41	0	6.2	10
84	48	Nil	29-4-25 9-5-25	46	0	0	33.2
85	80	Nil	4-4-25 24-4-25	47	40.3	62.5	100
86	88	Nil	11-4-25 21-4-25	47	40.3	6.2	50

* Approximate interval in months from date of inoculation and reaction.

Table I shows that 86 cases have been examined. The cases from 1 to 71 received only one injection at the last inoculation; of these 6 had no previous inoculations. The cases from 72 to 86 received two injections; of these 14 had no previous inoculation. The variation in the agglutinating power of the serum in different persons is well marked. One or two injections at the last inoculation with or without any previous inoculations do not appear to influence the reduced titre. Further, the variability is noticed not only in different individuals but in the same individual against different organisms. The cases with serial Nos. 10-18, 19-23, 43-47, 48-57, 58-67 who received the same vaccine on the same date have reacted differently between themselves as well as against different organisms. The cases with serial Nos. 2, 9, 27, 45, 64 who had one injection at the last inoculation with a record of previous inoculation show satisfactory protection after 3, 6, 10, 15 and 20 months respectively. But so does serial No. 70, thirty-three months after one injection and serial No. 85, forty-seven months after two injections without any further previous inoculations. On the other hand, the cases with serial Nos. 12, 19, 21, 36, 59, 74, 77 and 84 who had either one or two injections at the last inoculation and had either one, two or no previous inoculations, show negligible or indifferent protection after 6, 6, 6, 12, 20, 15, 18 and 46 months respectively. It can thus be deduced that one or two inoculations or re-inoculations with prophylactic T. A. B. vaccine do not ensure the same degree and duration of protection in all cases. This variation in reaction can be attributable to the variation in individual tissue response.

What then should be the minimum reduced titre capable of protection against a particular

organism after prophylactic T. A. B. inoculation? The Medical Research Council has recommended that in uninoculated persons for all species and types of standardized suspensions, a reduced titre of 5 to 10 is suspicious and one of more than 10 is usually diagnostic of infection. Working on that basis, we shall consider that after prophylactic inoculation a reduced titre of under 10 is negligible; one between 10 to 15 gives fair and one above 15 satisfactory evidence of protection; the higher the figure, the better is the protection. Table II represents an analysis of the cases in table I grouping them under different heads of 'reduced titre'. It will be observed that only 33.6 per cent. of cases show fair to satisfactory protection against all the T. A. B. organisms, while 66.4 per cent. of cases show either negative or negligible protection against one, two or all of them. Only 50 per cent. of cases against T., 64 per cent. against A., and 73 per cent. against B. show fair to satisfactory protection; 50 per cent. T., 36 per cent. A., and 27 per cent. B. show either negative or negligible protection. It is clear therefore that in spite of inoculations and re-inoculations about 30 to 50 per cent. of cases fail to develop the agglutinating power of the serum against one or more organisms after T. A. B. inoculation. The *Annual Report of the Public Health Commissioner with the Government of India for 1929* shows that the percentage of cases among British and Indian troops who contracted typhoid fever within six months of inoculation or reinoculation is about 39. We hold that those who do not develop satisfactory agglutinating power after inoculations are as liable to infection as the non-inoculated persons. This explains the incidence of the disease among inoculated persons. To ensure protection, repeated inoculations may be necessary in certain cases until the figure

TABLE II
Analysis of cases in table I

R. T.	* T. A. B.	T.	A.	B.	Protection
Nil	6 or 7.0 per cent.	23 or 26.8 per cent.	15 or 17.4 per cent.	12 or 14.0 per cent.	Nil.
Under 10	51 or 59.4 "	20 or 23.2 "	16 or 18.6 "	11 or 12.9 "	Negligible.
10-15	8 or 9.3 "	6 or 7.0 "	16 or 18.6 "	1 or 1.1 "	Fair.
Above 15	21 or 24.3 "	37 or 43.0 "	39 or 45.4 "	62 or 72.0 "	Satisfactory.

* (1) Six cases were completely negative to T. A. B.

(2) Of 51 cases, 23 were negative to one or two of the organisms. Twenty-eight had R. T. below 10 for one or two of the organisms.

(3) Eight cases had R. T. between 10 and 15 for each organism

(4) Twenty-one cases had R. T. over 15 for each organism.

for the R. T. is raised to over 10 for each organism. A record of the R. T. after prophylactic inoculation will be of considerable practical value.

Conclusions

(1) The 'reduced titre' (R. T.) of the serum after prophylactic T. A. B. inoculation is extremely variable in different individuals and in the same individual against different organisms.

(2) One or two inoculations and reinoculations do not appear to ensure a satisfactory degree and duration of protection in all cases.

(3) Taking 10 R. T. as the minimum figure for adequate immunity, 30 to 50 per cent. of inoculated persons are not protected against one or more organisms and are as liable to infection as the uninoculated. This explains the incidence of the disease in inoculated persons.

(4) Maintenance of an accurate R. T. record after prophylactic inoculation is suggested.

Acknowledgments

Our thanks are due to Major T. Stanton, R.A.M.C., and Major V. S. R. Pundit, I.M.S., for giving us every facility in carrying out this investigation.

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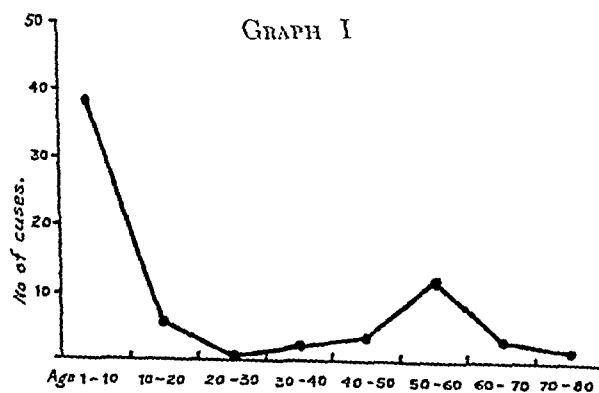
NOTES ON URINARY CALCULI

By B. P. SABAWALA, F.R.C.S.E.

MAJOR, I.M.S. (Hon.)

Chief Medical Officer, Dhrangadra State, Dhrangadra

In my series of 71 cases of stone 64 were males and 7 females. Of these, 39 were children under 15 years—37 being males and 2 females. Farm labourers and the lower classes—Kolis, Satvaras, Chamars, and Dheds—supplied 66 cases, whereas only 5 came from the Brahman and Bania classes. Sixty-six were Hindus and 5 Mahommedans; the local population consists of 83,000 Hindus and 5,200 Mahommedans. But the diets of both the communities are practically identical, meat being not a common article of diet among the people in this district. The diet mainly consists of *chapatis* made of *bajri* or wheat, whey and *khichdi* a boiled mixture of rice and dall. Fresh vegetables and fruit are scarce. The country round is hot and sandy with scanty vegetation, the average rainfall being about 15 inches. The people are dependent for their water supply on tanks or wells.



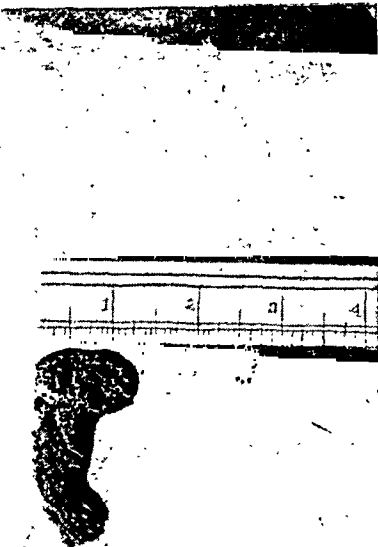
The incidence in this series is highest in the first decade, the number between the ages of 1 to 10 being 38. The next highest is between 50 and 60 the number being 14. Only 1 case occurred between 20 and 30.

This series bears out the statement that 'urinary stone is a disease of the extremes of

life'. The large proportion of cases in children under 10 ($= 53.5$ per cent.) can be explained on the finding that 'most stones of the lower urinary tract in children have a nucleus of primary renal origin' (Philip Wiles, *Lancet*, 11th October, 1930, p. 784). Of these 38, only 2 were females, the disease being relatively uncommon among this sex owing to the shortness, width and elasticity of their urethrae, permitting small concretions to pass through. Regarding operative interference, 40 were treated by lithotripsy and 31 by suprapubic cystotomy. Whenever an instrument could be passed crushing was given a trial. The large number done by the suprapubic route is explained by the number of children under 10, namely 38, where, owing to the small calibre of the urethra, it was impossible to introduce a suitable lithotrite. The anaesthetic employed was chloroform in 43 cases, spinal (stovaine) in 27, local infiltration (novocain) in 1.

Recently I came upon two cases of unusual interest, which I take this opportunity to record here :—

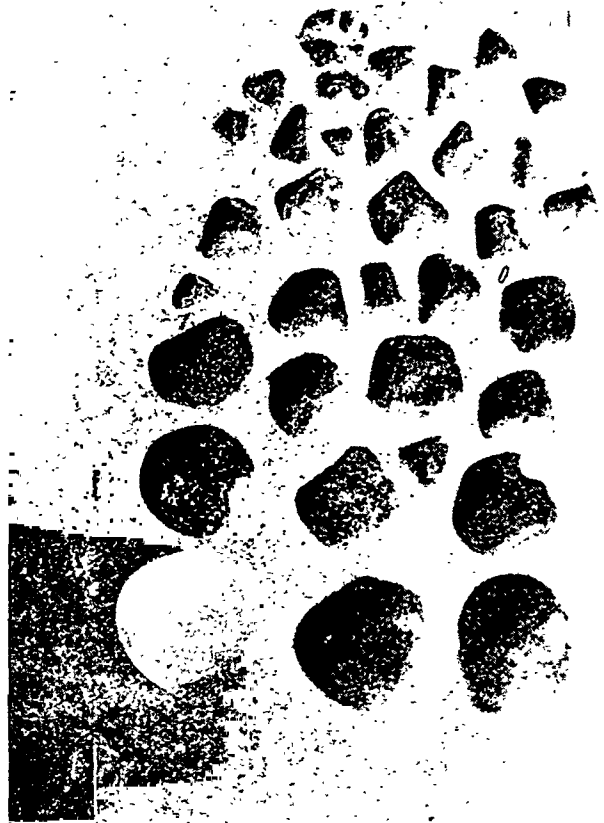
Case 1.—A woman, aged 30 years, was admitted for pain and frequency of micturition of eight months' duration. On examination a stone was seen projecting from the urinary meatus. Cystocele and prolapsus uteri were also present. While she was being prepared for extraction, an irregular, mushroom-shaped phosphatic calculus, $2\frac{1}{4}$ inches \times $1\frac{1}{4}$ inches, was expelled while straining during micturition. The urethral opening was widely dilated and easily admitted the index finger. The mucous membrane was ulcerated and covered with exuberant granulations, which bled readily on manipulation. These were touched with silver nitrate 2 per cent. and the bladder was irrigated daily. She left hospital a fortnight after admission. A photograph of the stone is enclosed herewith.



Case 1.

The next case of unusual interest was as follows :—

Case 2.—A woman, aged 40 years, was admitted with a history of burning pain, frequency, and dribbling of urine. She had passed small calculi per urethram two months previously.



Case 2.—Stones removed from the bladder.

The urine was foul-smelling. Per vaginam several vesical calculi could be felt. X-ray examination showed multiple stones in the bladder.

Under local infiltration (novocain 2 per cent. with adrenalin) suprapubic cystotomy was performed, and thirty-four rounded, faceted stones were removed. Their size varied from $1\frac{1}{4}$ inches \times $\frac{1}{2}$ inch in diameter. The patient left hospital one month after admission. A photograph of the stones and an x-ray print are enclosed for publication.



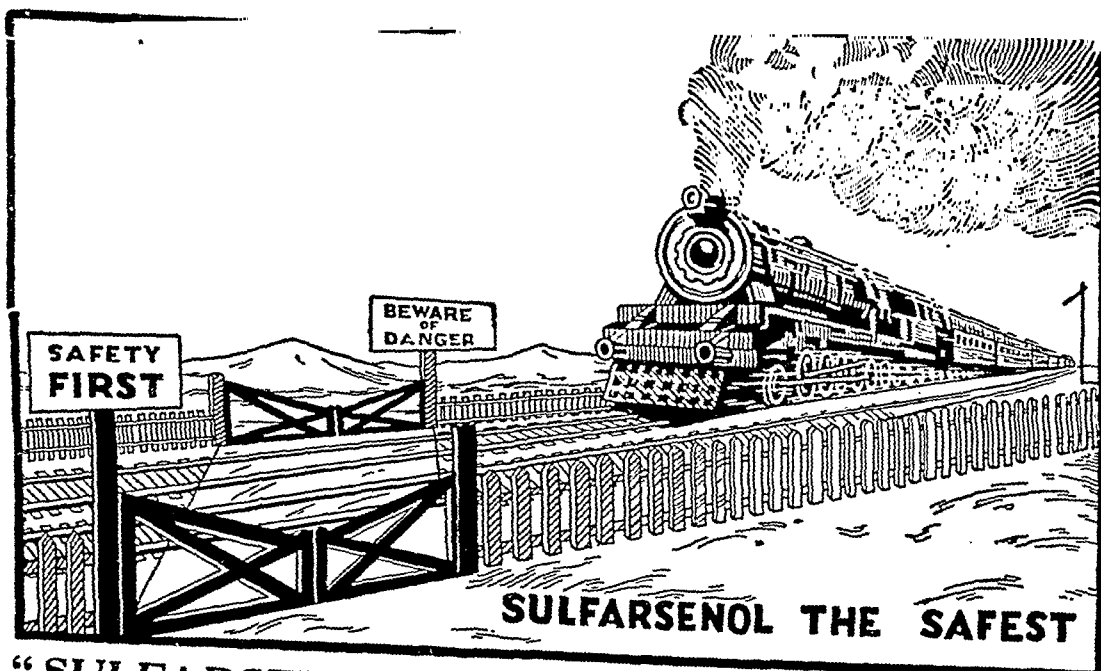
Case 2.—Skiagram of the bladder before operation.

The Special Blood Pressure
reducing principles of

Viscum Album, Hepatic
and Pancreatic
Extracts.

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For
the treatment of
all conditions
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High Blood Pressure.



"SULFARSENOL" is the safest arsenical,
the least liable to oxidation and the least toxic.
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Composition :

Fe. 1.17 grammes (Form, Nutritive Iron)

Fe. 0.33 grammes (Form, Colloid FeH_2O_2)

Mn. 0.2 grammes (Form, Colloid MnH_2O_2)

P. 0.36 grammes (Form, Combined P_2O)

Syrup and aromatics sufficient to make 100
cubic centimetres.

Advantages of Fer-Ma-Pho:

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Indian Medical Gazette

SEPTEMBER

MALARIA IN CALCUTTA

THERE has been so much published in both the local medical journals and in the lay newspapers during the last two years with regard to malaria in Calcutta city that we have deliberately refrained from dealing with the subject in our columns until authentic information became available. Opinions expressed have varied from statements that Calcutta is on the verge of an explosive epidemic of malaria due to the recent importation of *Anopheles ludlowii* which may almost ruin its trade as a commercial centre, to the opinion expressed by the Mayor (Dr. B. C. Roy) that the residents of Calcutta may sleep safely in their beds—(though they are liable to be bitten there indiscriminately by *Culex fatigans* infected with filariasis, *Aedes aegypti* infected with dengue, and by *Anopheles stephensi* possibly infected with malaria). Some 10 per cent. of the population are infected with filariasis; dengue sweeps the city in epidemic form every five or six years, affecting some 40 per cent. of the population and causing enormous economic loss; if to these are to be added epidemic malaria conditions, the outlook is very far from reassuring.

Fortunately, authentic information is now available in the admirable report on 'Malaria in Calcutta' by Major G. Covell, M.D., I.M.S., Assistant Director, Malaria Survey of India*, published in June 1932, as the result of his survey of Calcutta carried out in January and February of this year. Major Covell's report is a model of what such a report should be—well written, concise, full of information and collected data, restrained in its comments, but very definite in its conclusions. For many years to come it will be the standard work of reference to the subject and should be invaluable alike to local malaria workers and to the public health authorities.

From the early records it would appear that at one time, prior to the introduction of a piped water supply and of water-carriage conservancy, Calcutta was very malarious. Within a decade of Job Charnock's landing on the deserted river bank in 1690 there were reported to be some 1,200 English inhabitants of whom 460 were buried between the months of August

and January in one year.....'the miseries of the fever-stricken band throughout 1690 and 1691 are not to be told in words' runs an old report. In the autumn of 1756 British troops in ships at Falta Point were decimated by 'malignant fever'. In 1880 the Government of Bengal passed a resolution to the effect that the reclamation of the Saltwater Lakes to the east of the city was a project which the growing prevalence of fever in Calcutta made urgently necessary; to-day (1932) the Saltwater Lakes are still undrained. Dr. Cook, Health Officer of Calcutta, in his annual report for 1899 comments on the impossibility of controlling malaria in Calcutta on a budget provision of Rs. 30 a month, including pay of establishment. The year 1900 saw a sharp epidemic outbreak in Kidderpore Docks which seriously interfered with the coaling of ships. In the same year Capt. (now Sir Leonard) Rogers found spleen rates of 11.2 and 13.2 respectively to the north of the city in the water-logged areas of Chitpore, Cossipore and Manicktala, though in 1901 Stephens and Christophers found an almost complete absence of splenomegaly in children in Calcutta city itself. In 1906 Rogers pointed out that, although the endemic (parasite) index was nil, yet localized outbreaks of malaria had occurred at Kidderpore Docks, at Garden Reach, and among the nurses at the Presidency General Hospital.

The annual reports of the Health Officer of Calcutta for the years 1911 to 1930 show that endemic malaria occurs chiefly in the southern and south-eastern wards of the city, although some of the central wards in the Bow Bazar Street area are also infected. In 1920 Iyengar reported that malaria was to some extent prevalent in Calcutta city and that people who had never left Calcutta might contract the disease in the city itself. He concluded that *A. stephensi* was the chief, if not the only vector in the city. De in 1923 came to the same conclusions, whilst Basu in 1930 showed how very heavily the central part of the city is infested with *A. stephensi*, no less than 1,131 breeding places of this mosquito having been discovered within an area one square mile in extent.

Up to 1930, therefore, the position was that, although the environs of Calcutta—Garden Reach, Ballygunge and Alipore—were known to be somewhat malarious, and although small localized outbreaks were known to occur even within the city itself, yet in general Calcutta could be regarded as non-malarious.

In the autumn of 1930, however, severe outbreaks of malaria occurred at Budge-Budge and Chengail, situated on the left and right banks of the Hooghly respectively, 12 miles south-west of Calcutta, and were investigated by Mr. Iyengar and Dr. Sur of the Bengal Public Health Department. It was found that

* Covell, G. (1932). Malaria in Calcutta. *Records of the Malaria Survey of India*, III, No. 1, p. 1. Thacker's Press and Directories, Ltd., Calcutta, June 1932.

Anopheles ludlowii, which had previously been found in the deltaic area in Khulna District, around Fraserganj at the mouth of the Hooghly, and in the Sunderbans area, had now established itself at Budge Budge and the situation was an extremely serious one. Local spleen rates among children in the jute mills area were from 78 to 91 per cent., whilst mosquito dissections of this species in the locality in October-November 1930 gave an infection rate of no less than 23.4 per cent. In forwarding this report, Dr. Bentley, then Director of Public Health, Bengal, wrote as follows:—'I cannot too strongly emphasize the importance of checking the spread of this dangerous species of *Anopheles*, as the port and the city of Calcutta and the mills with a large amount of capital and labour are situated in an area which is potential for the breeding of the species. They will be in danger if once *Anopheles ludlowii* settles in the salt lake area, and in the slightly saline tanks and ponds along the river course.....I think that if the problem is not taken up in right earnest in its present stage, it may reach an enormity which it would be practically impossible to deal with'.

Public attention was now drawn to the matter by articles in the newspapers and the '*ludlowii* menace' to Calcutta became a subject of acute controversy. This species of *Anopheles* is one of the most efficient malaria carriers known. It is responsible for the malaria of the Andamans, for epidemics of malaria in the Federated Malay States, and was incriminated in several outbreaks in the Dutch East Indies. It is also an important vector on the coast of Burma. It is a 'domestic mosquito', a voracious feeder and a strong flier, with a marked preference for the blood of man. It is a brackish water breeder and has been found breeding profusely in waters containing from 0.03 to 1.8 per cent. of sodium chloride, and it can tolerate a considerable degree of organic pollution in its breeding places.

The position at the end of 1930 was therefore very far from satisfactory. It was freely stated that there had been an unusual amount of malaria that year contracted locally in Calcutta itself, although the hospital registers failed to confirm this. The Salt Lakes used to be tidal, and therefore unsuitable for the breeding of *A. ludlowii*; the silting up of the Bidyadhari River, however, which receives the sewage outfall of Calcutta has of recent years rendered the Salt Lakes non-tidal, and this, together with the organic pollution of the water might render these huge sheets of water immediately to the east of the city suitable for *A. ludlowii* breeding. If once *A. ludlowii* and malaria were freely introduced into Calcutta city, *A. stephensi* would take on the transmission, and the 'second city of the Empire' might see one of the worst epidemics of malaria

ever recorded. Or, at least, so said the pessimists.

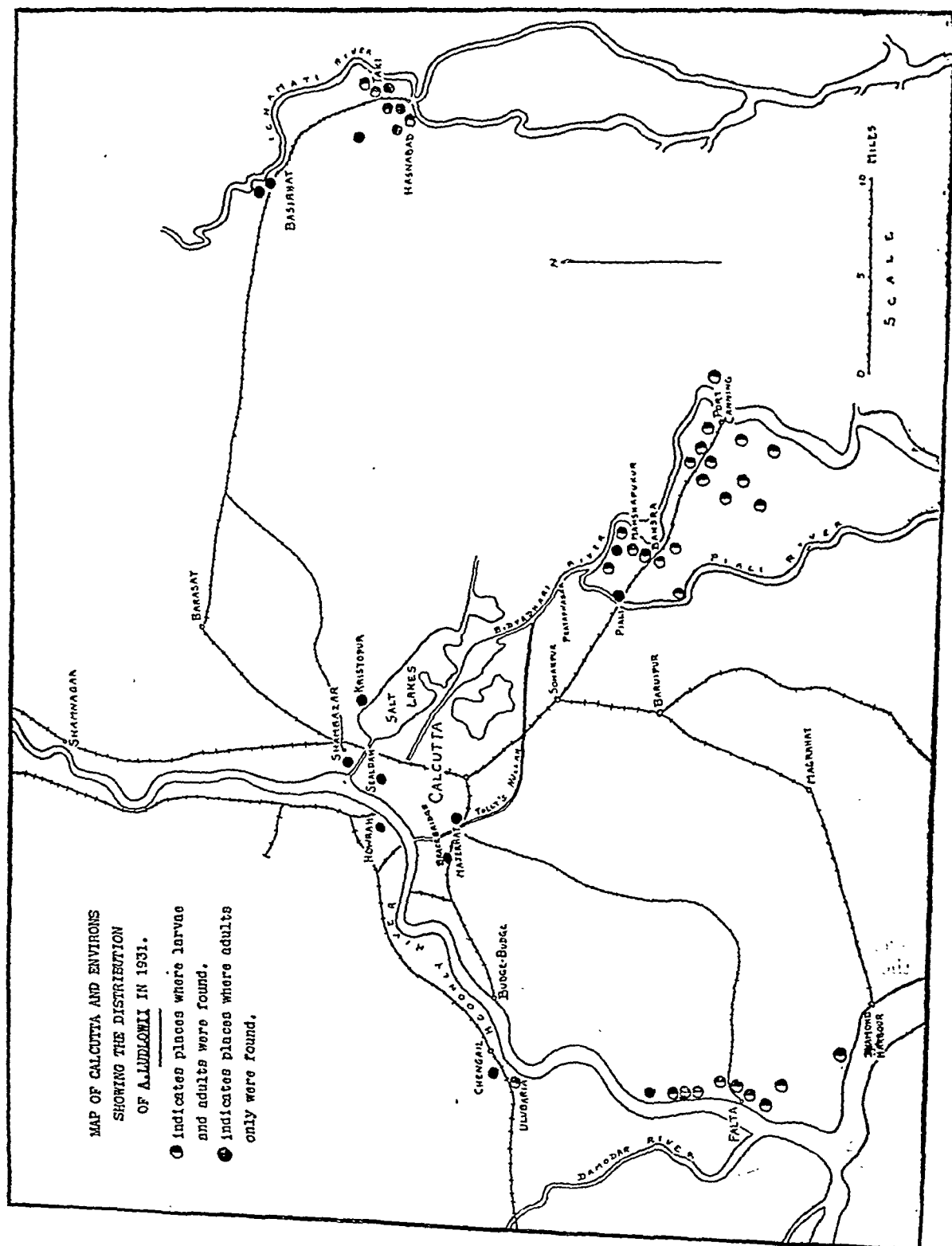
Further investigations in 1931 did not improve the outlook. The position is shown in the map on p. 513, taken with due acknowledgments to the Director of the Malaria Survey of India from Major Covell's report. Breeding of *A. ludlowii* was known to occur at Taki in the Basirhat Subdivision, and from here adults were found to be brought into Sham-bazar in the heart of the city by the light railway. Port Canning, to the south-east of Calcutta, is an important breeding site for *A. ludlowii*, and from here there is special danger of colonization of the Salt Lakes, whilst adult mosquitoes are being brought into Calcutta from this area in country boats on the Bidyadhari. In the autumn of 1931 a virulent outbreak of malaria occurred at Falta, 12 miles south of Budge Budge, and here extensive *A. ludlowii* breeding was discovered. Similar conditions prevailed at Ulubaria, 5 miles below Budge Budge. Large numbers of adult *A. ludlowii*, of which 8 per cent. were found to be infected with malaria, were captured in trains coming from Falta to Majerhat station, situated at the edge of the extensive swamps lying immediately south of Kidderpore Docks. Adult specimens of *A. ludlowii* were captured freely on country boats coming into Calcutta from down stream, in Kidderpore Docks, at Howrah station, and even as far north as Shamnagar, 19 miles north of Calcutta up the Hooghly. Thus the city was encircled with localised breeding sites of this very dangerous species, the presence of it at Falta, Budge Budge, Chengail and Ulubaria appeared to represent recent colonization up stream by this species, and the swamps at Majerhat to the south of Calcutta and the Salt Lakes to the east appeared to represent areas, which if colonised, might very well ensure epidemic malaria conditions in Calcutta city itself.

A conference was held in March 1931 by the Hon'ble Minister in charge of Public Health with the Government of Bengal, and a sub-committee was appointed to watch the situation and to make recommendations. Sanction was given to the Director of Public Health to employ a survey staff at a cost of Rs. 7,500, and for a further sum of Rs. 13,000 for control measures. In 1931 the Garden Reach Anti-Malaria Association was formed by contributions from the different railway and trade interests concerned, and it commenced control over an area of 613 acres in that district, as well as subsidiary controls on the ferry steamers and pontoons and in Kidderpore Docks. The Bengal Public Health Department carried out control measures at Falta and other outlying danger areas, and the Eastern Bengal Railway commenced control measures at Budge Budge and Port Canning.

In December 1931 the situation as regards malaria in Calcutta and its vicinity was discussed by the Malaria Sub-Committee of the all-India Conference of Medical Research Workers, and a resolution was passed recommending that an enquiry be undertaken by an officer of the Malaria Survey of India. At the

request of the Government of Bengal, accordingly, Major Covell carried out a survey in January-February 1932, and the present report deals with the results of this survey.

Major Covell's first problem was to ascertain exactly the present amount and distribution of malaria in Calcutta—a question on which,



as we have seen, there was considerable difference of opinion. He carried out observations on the spleen and parasite rates in different wards of the city, differentiating between children who had probably acquired their infection in Calcutta itself, and those who had probably contracted it elsewhere. In all 8,945 children were examined for the spleen rates; and blood films taken from 3,294. The results showed that as a whole Calcutta city is very free from indigenous malaria. In the majority of the wards the parasite index was below 5 per cent., and in six wards it was *nil*. The northern part of the city proper is almost entirely free from malaria infection, but Ballygunge and Tollygunge gave parasite rates of 8 and 7 per cent. respectively, whilst some of the wards in the central part of the city also yielded high rates. The general spleen rate was 4 per cent., but half these children had probably acquired their malaria outside Calcutta; the general parasite rate was 2.6 per cent.—80 per cent. of the infections being with *P. falciparum*. 'Taking all the available evidence into consideration', writes Major Covell, 'it is clear that although endemic malaria in Calcutta is very slight in amount, there is an appreciable amount of local transmission of the disease, originating chiefly from cases imported from outside, and that in some parts of the city there were an unusually large number of cases in 1931. Although local conditions may apparently remain unchanged, the prevalence of malaria, as is the case with other diseases, does not remain static, but tends to occur as it were in waves, a few years of increased malaria alternating with periods of diminished prevalence. It appears probable that the incidence of malaria in Calcutta decreased from about the year 1925 to 1930, and that it is now on the upward grade'. This first conclusion of Major Covell's is of importance, for not only does it show that a certain amount of malaria transmission occurs within the city itself, it also shows that the majority of the population are probably susceptible to infection and that the factor of immunity does not come into the picture.

The chief source of danger in Calcutta city is: the universal breeding of *A. stephensi* in every cistern of filtered and unfiltered water in the city. Owing to the smoke nuisance there has been a general shifting of kitchens to the roofs of buildings, and with this has resulted an increased demand for filtered water on the roof. The number of water connections has increased as follows:—

and every one of these connections is not merely a potential, but usually an actual source of breeding of *A. stephensi*. Further, *Aedes aegypti* breeds universally in the same sites and freely transmits dengue in the epidemic season.

The main problem in malaria control in Calcutta, therefore, is the control of *A. stephensi* breeding. Every cistern in the city should be made accessible for monthly inspection, should be numbered, rendered mosquito-proof, and padlocked. Water-gauges should be of mosquito-proof pattern. Any cistern found not to be mosquito-proof should be remedied at the owner's cost, and no new cistern installed until it has been inspected and passed by the Malaria Officer. Masonry cisterns, garden tubs, etc., should be completely emptied out at least once a week. Stand pipes should in every case be provided with a cement drain connected with the main drainage system, and road watering hydrants should be provided with a cover which has no aperture in it. Disused tins and other receptacles must be dealt with, and water used to keep concrete wet treated with cresol. Fire buckets should be filled with sand, or if water is used cresol should be added to it. Legislation already exists under the Calcutta Municipal Act for enforcing all or almost all the recommendations made, but such legislation requires to be put in force.

Turning to the '*ludlowii* problem' here the two dangerous areas are (i) the swamp near Majerhat to the south of Kidderpore, and (ii) the Salt Lakes to the east of the city. The first is being gradually filled in with silt from the bed of Tolly's Nullah, but it will take at least five years to complete this work. Fortunately, the salinity of the water in the swamp is considerably lower than the optimum concentration for breeding of *A. ludlowii*. If the breeding places at Falta are efficiently controlled, breeding of *A. ludlowii* in the Majerhat swamp is unlikely. As regards the Salt Lakes these are large sheets of water, especially during the rains, whereas *A. ludlowii* prefers small collections, but the position requires most careful watching. Any engineering project (in connection with the drainage system of Calcutta) which will provide for the opening up of the channel of the Bidyadhari River and the restoration of tidal influence in the Salt Lake basin should be regarded as an important anti-malaria measure. So far the situation with regard to *A. ludlowii* has been kept under control by the Bengal Health Department, with the co-operation of the Garden Reach Anti-Malaria Association, and of the anti-malaria staffs of the Bengal-Nagpur and Eastern Bengal Railways, but it is recommended that the staff of the Bengal Health Department should be immediately increased by the addition of two more survey units, and that it should be empowered to institute control measures at any

Year.	Filtered water.	Unfiltered water.
1870	.. 780	0
1900	.. 25,901	3,577
1932	.. 50,528	41,702

point where these may be found necessary, a sum of Rs. 10,000 being set aside for such measures.

Country boats coming into Calcutta up the Hooghly should be inspected at Falta, and those on the Bidyadhari River at Pratapnagar, and their thatched covers temporarily removed. This procedure would greatly minimise the danger of *A. ludlowii* being carried up the Hooghly from the Sunderbans and Midnapore, and into the Salt Lake area from the direction of Port Canning. Rigid control measures against breeding of *A. ludlowii* should be carried out at Falta, Port Canning and Hasnabad where breeding is still going on, also in any newly discovered breeding area. Finally, it is very desirable that spleen and parasite rates of municipal school children should be ascertained and recorded annually in each ward, and that all local hospitals should keep a separate roster of malaria cases considered to have acquired their infection locally.

It will be very interesting to see what action is taken on Major Covell's most important report. There is nothing of the scare headline about the report, but it emphasises very emphatically the supreme necessity for immediate and future action. Calcutta is already content to put up every few years with devastating epidemics of dengue which are completely preventable; will the citizens of this city be content to see epidemic malaria added to their other plagues, or will they take the necessary action to prevent it?

THE NOMENCLATURE OF BACTERIOPHAGE

It is little more than a decade since d'Herelle first announced his discovery of the phenomenon of lysis of bacteria in culture. This he ascribed to a minute infecting organism to which he gave the name bacteriophage, which was a fortunate choice as it is at once simple and fully descriptive.

This action on bacteria is now a firmly established fact and it promises to become of increasing importance both in the realms of therapeutics and public health. From the large volume of work that is now being carried out by workers in almost every part of the world where scientific investigation of health and disease is conducted, it appears probable that every bacterium will eventually be found to be capable of infection by one or more bacteriophages* specific to itself.

When this work was in its infancy and the bacteriophages of only one or two organisms were being studied by a single investigator this name was adequate, and one readily understood what 'bacteriophage a, b, c' or perhaps 1, 2, 3 referred to, but now that the subject is being

studied by so many workers and in relation to so many different bacteria the word bacteriophage followed by a simple symbol is no longer sufficient.

All of us who have had anything to do with nomenclature, either zoological or botanical, know the immense difficulties that have been added to phylogeny by the multiplicity of names that have been given to a single species of animal or plant by different workers over a number of years, or by the same name being used for different species. This has perhaps been unavoidable in the above instances and classification has been and still is being gradually evolved as our knowledge of species increases, and one feels that finality may never be achieved.

Under existing conditions the nomenclature in what might be termed the science of 'bacteriophagology' shows every evidence of falling into the same chaotic state, for each worker at present has his 'bacteriophage 1, 2, 3; I, II, III; a, b, c', etc., and the same sets of these symbols are already used by different workers to indicate entirely different bacteriophages. Even now it is often necessary to read a long way through a paper to find what organism the bacteriophage named after one of the above examples is active against, and in the course of a few years it seems not unreasonable to forecast that for purposes of identification a given bacteriophage will have to be designated somewhat as follows:— 'Bacteriophage a Jones, 1932 (acts on cholera)' so that it may be distinguished from all other bacteriophages that happen to have been named 'a'.

As a simple alternative we suggest that the name of the bacterium be prefixed to the universal root 'phage'; we would then have 'cholera-phage', 'shiga-phage', 'pneumophage', etc., which are at once self-explanatory.

We accordingly advance the plea for the immediate formation of a small international committee to draw up a short system of rules of nomenclature for this rapidly growing subject. It appears to us that actual conferences of such a committee would not be needed, but if attacked before it becomes too unwieldy, the matter could be satisfactorily dealt with by correspondence, or if this is not feasible perhaps the Health Section of the League of Nations might be able to take the matter up.

Special Article

THE 'NEGATIVE PHASE' IN PROPHYLAXIS BY INOCULATION OF VACCINES

By A. D. STEWART,

LIEUTENANT-COLONEL, I.M.S.

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If we may judge by many recent enquiries, both verbal and by letter, it would appear that belief in the

* There is some disagreement in the spelling of the plural of bacteriophage; in this we have followed d'Herelle.

dangers of a 'negative phase' or period of increased susceptibility to infection following immediately on prophylactic inoculation by vaccines is fairly widespread among the profession in India at the present day, and the fears of this added danger have been passed on to the public. The question of its existence has not been so prominent in preventive inoculation against smallpox and enteric fever, or even plague, perhaps because a greater number of vaccinations and inoculations against these diseases are done on grounds of general prophylaxis and not necessarily during an epidemic. I have found that at the present moment it is mostly in regard to cholera that doubt arises in the minds of practitioners whether they should advise preventive inoculation during the occurrence of an epidemic, for it is usually in these circumstances or in the presence of an epidemic of cholera in the immediate vicinity that voluntary inoculation is pushed and accepted.

Under the circumstances, it may be profitable to discuss the matter shortly, in the light of recent experience and opinion. The phrase 'negative phase' was coined by Wright as the result of his studies on the opsonic index. In his earlier publications (*Lancet*, 1901, *Lancet*, 1902), he considered the risk of the negative phase as very real. In his later publications however his opinions are expressed much more guardedly. In his *Studies on Immunisation* (1909) he states 'It has been shown (a) that where the dose of bacterial vaccine employed was sufficient to produce marked constitutional symptoms, inoculation was followed first by a negative phase of diminished bactericidal power—corresponding it may be presumed to a phase of diminished resistance, and (b) then after an interval of a few days by a positive phase of increased bactericidal power—corresponding it may be presumed to a phase of increased resistance'. He notes that the extent and duration of the phase of diminished resistance are a function of the dose administered. In the preface to the same book he comments on the practicability of controlling the negative phase and of the possibility of immunisation without risk of delay.

It would thus appear that the earlier exaggerated belief in the danger of the negative phase has been survived by a much more moderate opinion of its creator.

Pfeiffer in 1908 doubted Wright's conclusions on experimental grounds and showed that guinea-pigs inoculated with large doses of vaccine did not show any increased susceptibility to intraperitoneal injection with living cultures, but, on the contrary, that their resistance was distinctly increased and that this change was apparent after a few hours.

Russell (1913) of the American Army Medical Service in a discussion on anti-typhoid inoculation is very definitely of opinion that with the dosages employed, there is undoubtedly no evidence for the belief of the existence of the negative phase. He quotes the experiences of Leishman and other authorities, of hundreds of inoculations for typhoid done during epidemics with no evidence whatever of increased susceptibility immediately following vaccination. Russell himself as the result of his own large experience arrived at the same conclusions.

In respect of anti-typhoid inoculation therefore it would be safe to be quite assured that there is no evidence in practice to fear a negative phase in the inoculation of human beings with the doses ordinarily employed, and that inoculations can be performed safely in the face of an epidemic.

Coming to plague, it is somewhat surprising to us in India to have the efficiency of plague prophylaxis by vaccination seriously doubted at the present day. Some recent experiences in the Mediterranean area of Europe, however, led the Office International d'Hygiene Publique in Paris to circularise countries signatory to the International Sanitary Convention on the matter. In the *Bulletin Mensuel* of the 'office', March 1932, particulars of a questionnaire on anti-plague vaccination are given—one of the questions asked is, 'Is there, immediately

after vaccination, a period of enhanced susceptibility?' Workers in India have already long ago answered this question in a fairly certain manner. Haffkine and Bannermann in 1901 and 1902 published figures showing that Haffkine's prophylactic has the power of abating and diminishing the severity of an attack of plague in the case of any patient who may have been inoculated in the incubation stage of the disease. The figures are summarised in the *Handbook of the Haffkine Laboratory*, 1924. In the investigation quoted the case mortality amongst the non-inoculated was 73 per 100. The case mortality amongst those showing signs of plague at the time of inoculation was 48.8 per 100. In cases of plague where the symptoms appeared on the first day after vaccination the case mortality proved 57.5 against 73.3 per 100 in the uninoculated. The figures of Haffkine and Bannermann were carefully collected and controlled, particular care being taken to see that the controls of non-inoculated were representative and not packed. On the animal side, the experiments of Stevenson and Kapadia in 1911 and later appear to be quite conclusive that in non-immune rats the injection of Haffkine's prophylactic, in 0.25 c.cm. doses, was never followed by increased susceptibility to a lethal dose of virus even within 1½ hours after vaccination, but on the contrary that the production of immunity among rats commences within a few hours of inoculation and increases in amount till the 2nd or 3rd day.

In plague also therefore with the doses of the Haffkine prophylactic employed, the direct evidence is strongly against or actually disproves the existence of any 'negative phase'.

In smallpox, practically every one is agreed that no harm but much possible benefit may accrue from vaccination during the incubation period. In the earlier stages of the incubation period, vaccination will prevent the development of smallpox; in the middle stages, a modified smallpox will result, while in the later period, successful vaccination and smallpox may be seen together. It is these last cases which are sometimes cited both as failure of protective vaccination and as evidence of a sensitising action of vaccination. The phenomena are admissible of complete explanation when the inoculation periods of the two affections are considered, and the time known to be taken (8 days) by vaccination to produce immunity.

With regard to cholera, the evidence of the protective power both of parenteral vaccination and bilivaccine is fairly strong, though some reasonably sceptical authorities do not yet seem to consider that the case has been thoroughly tested and proved. Haffkine's original work in India, the experience in the Balkan War, the results of the Dutch (Flu and others) in Java, of the Japanese in Korea, of various sanitarians in India (Russell, Bentley and others) can all be appealed to with confidence in support of the protective power of parenteral inoculation of anti-cholera vaccine. Statistically Russell's account of work in Madras (1927) is the most convincing.

Russell conducted a carefully controlled investigation in Madras Presidency in 1927, both with vaccine and bilivaccine. He concluded that the unprotected were attacked 5.6 times more frequently than the protected, and that the percentage mortality amongst the attacked in the unprotected was also 5.8 times higher than that amongst the attacked in the protected. (He concluded that the full dosage of bilivaccine gives much the same degree of protection from attack as the double inoculation with cholera vaccine).

From a mathematical consideration of the figures he concluded that definite protection is acquired after three days. His table of correlation coefficients between treatment with vaccine and cholera attacks is negative throughout, excluding cases occurring within the first three days after inoculation. Russell purposely excluded the figures of the cases for the first three days after inoculation in order to make his statement clearer as regards the ultimate benefit of anti-cholera inoculation. His figures show that there were 71 attacks

and 19 deaths amongst those who had been inoculated in the previous three days before their attack. This case mortality was less than the case mortality amongst the 59 cases occurring amongst those who had been inoculated 3 days previously. While one would not lay too much stress on this, it at least suggests that inoculation within the previous 3 days does not at all events make the disease more severe. So far as cholera is concerned therefore we may be justified in concluding that in the mass, the chances of an inoculated individual being attacked are reduced by something like 5 to 1; that the immunity has definitely developed on the 3rd day after vaccination, but that during this period there is at least no evidence of a negative phase or increased susceptibility, but rather the reverse. The immunity, however, is not on the same scale of value as that for persons protected against smallpox by vaccine lymph.

Experience in Bengal has shown that reduction in incidence of cholera *en masse* does not begin to be evident until 10 per cent. of the population are inoculated. Results reported from Java state that when 60 per cent. of the population are inoculated cholera practically disappears.

Unfortunately we have no means of investigating the question experimentally on animals, as is the case in plague. Topley and Wilson (1927) may be quoted as representative of the modern view on the general question of the negative phase, 'It is perhaps necessary to touch upon the question of the negative phase, i.e., the possibility that there is a period immediately following the inoculation of the vaccine during which the recipient is more susceptible to infection than before it was administered. In so far as this effect is specific it is clearly related to the presence of the specific bacterial antigen, and may be regarded as aggressive in character. It would appear unlikely in any case that it is other than transient, unless enormous doses of vaccine are administered. From the point of view of prophylaxis, it can probably be disregarded, though there is little doubt that its neglect, in unwise attempts at curative vaccination, might lead to disastrous results'.

In prevention work then, I think we may safely ignore the bogey of the 'negative phase'.

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A Mirror of Hospital Practice

ANTHRAX PUSTULE OF THE NECK

By N. HUSAIN, M.B., B.S.

Medical Officer, Kishtwar, Kashmir State

D. K., A KASHMIRI BOY, 17 years of age, was admitted to Kishtwar Hospital with an itching and burning lesion

of the skin in the lower part of the right posterior triangle of the neck. He had been lately engaged in handling wool which is found in every home in this part of the world. It first appeared as a small, raised pimple three days prior to admission, and the patient ascribed it to some insect bite. He had himself applied tincture of iodine to it without any relief. The lesion kept on increasing. There was a central black slough, surrounded by two or three rows of shining white vesicles, which in their turn were encircled by a deep-red, and somewhat raised margin which was sharply defined from the adjacent healthy skin. There was no oedema. The glands in that part of the neck were slightly swollen. On the fifth day of the disease the patient had a rise of temperature to 102°F., with slight headache and malaise. On the seventh day the lesion had increased to a diameter of 4 cm., and was exuding a clear fluid. No blood examination was done. The microscopic examination of the fluid revealed the presence of anthrax bacilli alone.

The people of this part of the country are 95 per cent. agriculturists, and, as it is a mountainous and cold country, they all keep sheep and goats and invariably use home-made woollen clothes. Lesions of the above typical description are very common among them. Consequently every one is familiar with this disease. From their long experience with this malady, these people have found that absolute non-interference with the pustule is the best. The result is that there is a very low mortality from it. So, guided by the experience of the people here, I did not resort to any treatment in this case excepting an intravenous injection of 0.3 gm. of Neosalvarsan which I am sure did not do any good to the patient as is shown by the usual course of the disease. The patient was confined to bed and the pustule was covered with a dressing of boric ointment.

The pustule began to dry up on the 12th day, with disappearance of constitutional symptoms. The patient left the hospital on the 16th day of the disease, cured. The black central slough was then separating off the skin, leaving a moist soft scar underneath. The surrounding red raised margin had later taken on a dusky red appearance (i.e., after the 7th day).

A MYCETOMA-LIKE CONDITION OF THE FOOT

By G. H. FITZGERALD, M.R.C.S., L.R.C.P.,

D.T.M. & H. (Lond.), D.F.M. (Cantab.)

CAPTAIN, I.M.S.

Civil Surgeon, Kamrup

THIS case, the appearance of which is clearly shown in the photograph, is perhaps worthy of record by reason of its obscure aetiology. The patient, a man aged 32, came from Sambalpur in the Central Provinces, and for some eleven years his right foot had been in this condition. His account was as follows:—

The first he noticed was a vesicle on the front of the ankle, the scab over which he seems to have removed, when probably as a result of secondary infection the entire leg

swelled up, the inguinal glands enlarged, and there was some degree of fever.

In fourteen days this subsided, after treatment by indigenous drugs.

A pustular eruption then developed on the foot, some pustules granulating, whilst others developed. The pustules continued for eighteen months. At this time there was considerable itching. The granulation tissue gradually assumed the mossy appearance seen in the photograph.

He had not noticed a similar condition in any others in his village, though he was familiar with filariasis.

He now, from time to time, has bouts of moderate pyrexia, when the foot becomes painful, but normally apart from the increased weight which has led to some hypertrophy of the leg muscles, it troubles him very little. He refused amputation, as he considered an artificial limb would be less useful.



The foot is enlarged transversely to about three times the normal, there is no increase antero-posteriorly. The toes and the skin of the sole are normal. The whole foot has a curious corrugated appearance, with here and there depressions as if at one time there had been discharging sinuses. The mossy parts are rough and hard to the touch, like elephant hide, whilst the smoother portions are elastic and feel rather like a commencing brawny oedema. At the junction of ankle and foot, there is a well marked line of demarcation and in the front an area of indolent pinkish granulations. These are smooth at the proximal part, but at the base they are assuming the mossy character though not as yet epithelialized. Smooth scarring, quite different in character, extends up the lower third of the leg, the skin is thinned and atrophic and adherent to the bone. There is evidence of old periostitis of the tibia, probably a relic of the early sepsis referred to above. The inguinal glands are not enlarged.

The bones of the foot could not be felt and without *x*-rays nothing can be ascertained concerning them. The general health of the patient is excellent.

The Wassermann reaction was reported as \pm ; in the absence of any history or clinical signs of syphilis, this cannot be considered of much significance.

A small portion was removed and sent for section. The Pasteur Institute, Shillong, reported 'Chronic inflammatory process in the cutis vera, no evidence of mycelium'. Smears taken from the exudate obtained by scraping some of the granulomatous areas showed cocci only. *Filaria* were not present in the blood.

The condition superficially bears a very close resemblance to that described as mossy foot (an excellent illustration of which is given by Sequeira), and attributed to the fungus *Phialophora verrucosa*. The absence of mycelial elements, however, appears to negative this diagnosis, whilst the Wassermann reaction is against both yaws and syphilis. Were the condition filarial, it would, I think, be reasonable to expect the thickening to have spread further up the leg in course of time, which till now it has shown no signs of doing.

Probably the most likely explanation is the persistence of a low grade bacterial infection, aggravated by lymphatic obstruction from the cicatrix around the anterior part of the ankle.

The views of others who have noted a similar condition would be of interest.

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(Note.—The condition of the foot is a pachydermia with a varicose condition of the skin here and there, and it is pathologically due to an inflammation in the corium, so that the fibrous tissue is increased and the skin becomes dense. Here and there the lymphatics going to the skin are nipped and hypertrophy of the surface layer occurs giving rise to this varicose or warty condition. The point to decide is what was the original cause of this fibrosis. As far as one can see from the photograph there are three scars about the ankle, and as an *x*-ray was not done of the bone and no mention is made as to whether the ankle joint is movable or ankylosed and the Von Pirquet's test was not done, the most probable cause is tuberculosis starting with the bone and invading the surface lymphatics. On the other hand, the history does not bear this out, so that it may be due to some rare infection by a hyphomycetes which can give rise to a similar condition.—EDITOR, I. M. G.)

A CASE OF COMPLETE ABSENCE OF THE PENIS

By K. SEN ROY, M.B., B.S., ETC.

Medical Officer, District Hospital, Ghazipur

A boy aged six years, was admitted into the District Hospital, Ghazipur, on 25th March, 1931, complaining of pain and swelling in

the abdomen for about the last year. The parents said they had noticed a swelling in the lower part of the abdomen for the last six months.

Local examination revealed a complete absence of the penis. The urethral opening was not to be seen anywhere on the scrotum or perineum. The parents stated that the boy had always passed urine through the rectum, and for the last six months urine was passed only at the time of defecation.

On searching for the urethral opening a tiny hole was seen in the anterior rectal wall a quarter of an inch above the anal aperture. A fine probe was inserted into the opening and it passed directly upwards into the bladder.

The swelling in the abdomen was round and of the size of an apple, situated centrally in the hypogastrium. On dilating the urethral opening and passing the smallest size silver catheter and drawing off the urine the swelling disappeared, showing it to be the distended bladder.

I am indebted to Major H. J. Garrod, I.M.D., Civil Surgeon, Ghazipur, for his kind permission to publish these notes from the hospital records.

NOTES ON A CASE OF SUPPURATING HYDATID CYST OF THE ABDOMINAL WALL

By KHAN BAHADUR AHMED BAKSHI, I.S.O.
Assistant Residency Surgeon, Indore

A FEMALE aged 25 years was admitted to King Edward Hospital on 27th February, 1932, with distension of the abdomen, and pain, impaired appetite, fever, difficulty in breathing, and slight jaundice.

History.—Three years ago she gave birth to a female child and during the puerperium she had fever which lasted for one month and then subsided. Two months after this she noticed her abdomen was getting large and pendulous. She remained in this condition for one year and then she went to a hospital where she was tapped and nearly six pounds of fluid were removed.

After this she was much better for a year and then she again noticed that the abdomen was getting large. The abdomen was again tapped and nearly four pounds of fluid were removed.

Seven days previous to her admission to this hospital, she felt sudden severe pain in her abdomen during defecation. This was attended with rigors and fever and then she came to this hospital. There was nothing abnormal about her menses. P. V. examination reveals nothing abnormal.

Present condition.—She is a young woman aged 25 and looks anæmic. The abdomen is large and measures $33\frac{1}{2}$ inches at the umbilicus. This is due to a swelling covering practically the whole of the abdominal area, and which is more prominent in the centre. There is tenderness, fluctuation and dullness on percussion, but the dull area does not alter with change of position. The tongue is dry and coated and the bowels constipated. Temperature 101°F .

and pulse 100 per minute. The urine contained a little albumen and hyaline casts but no other abnormalities. There was a leucocytosis 15,937 with 88 per cent. polymorphonuclears and no eosinophiles present.

The case was at first diagnosed as tuberculous peritonitis and the patient was prepared in the usual way for laparotomy.

Operation was performed on the 14th of March.

A paramedian incision 8 inches long was made extending both above and below the umbilicus over the most prominent part of the swelling. When the knife entered the posterior sheath of the rectus a large quantity of thick pus escaped. It was yellow and curdy and contained thick masses like degenerated daughter cysts. The swelling was laid open freely and it was found that pus was lodged between the parietal peritoneum and the transversalis fascia, the abdominal cavity was completely shut off by the peritoneum. Two drainage tubes were put in the lower part of the wound and the rest was closed. The patient was discharged cured on 21st April, 1932.

The pus and the degenerated cystic swellings were sent to the laboratory but no hooklets or embryos were discovered.

The following is the result of the laboratory examination:—

Culture of pus.—*Staphylococcus aureus*, and non-hæmolytic short-chained streptococcus, the former predominating.

Section from the cyst wall:—

Composed of fibrous tissue. No epithelial or endothelial lining; shows infiltration with polymorphonuclear and round cells.

I am much indebted to Col. R. F. D. MacGregor, M.C., I.M.S., for his kind permission to publish this case.

A LARGE OVARIAN CYST

By D. K. FAIRBAIRN, M.B., M.R.C.S., L.R.C.P.

Dufferin Hospital, Gorakhpur

THE patient, a Hindu aged 45 years, was admitted to hospital on the 28th February, 1932.

She could hardly walk and merely shuffled along very slowly. She was extremely emaciated, and had been very scantily nourished for some months before admission, owing to the uncomfortable sense of fullness and palpitation she experienced after eating.

She was married about 25 years ago, had one child, 9 years previous to admission and had not menstruated since; two years after the birth of this child she became conscious of a swelling in the lower abdomen, which slowly grew to its present size. It was within the last 6 months to a year that she began to experience discomfort, dyspnoea and palpitation, which led her to seek hospital treatment.

Abdominal girth at the umbilical level was 63 inches; she could neither lie down, nor use a bed rest, so remained in a more or less upright and squatting position all day and night.

A laparotomy was performed on the 12th March, 1932. The cyst was found to be adherent to almost every organ with which it was in contact—to the abdominal wall in front and sides, to the omentum, and to the large and small intestines in various places. Adhesions were separated with difficulty—the cyst was tapped to reduce its bulk, and it was separated from the right ovary by ligature of the pedicle.

The fluid was of the usual jelly-like consistency, and slightly blood-stained.

The cyst wall was very thick, and the tumour itself was one-quarter solid.

The weight of the tumour was 14 pounds and the amount of fluid it contained was 50 pints.



The patient suffered from slight shock after the operation, and then ran an uninterrupted convalescence—and left hospital very fit and well a month later.

A CASE OF CONGENITAL MALFORMATION OF THE RECTUM TREATED BY COLOSTOMY

By SURFESH CHANDRA DAS GUPTA, L.M.S.
Senior Surgeon and Chief Medical Officer, Bir Hospital,
Katmandu, Nepal

ABOUT seven years ago a baby aged a week old was brought to Bir Hospital for treatment of an imperforate anus, the stools being voided through the urinary passage. Later when the stool became hard the baby began to scream continuously, so the father and mother brought it for treatment.

On examination.—There was complete absence of the anus, and not even a dimple or furrow marking its usual site could be detected. Under general anaesthesia the child was operated on. I made a long incision in the perineum from the lower end of the scrotum to the tip of the coccyx and I passed a sound into the bladder to act

as a guide and to save the urethra from damage. I deepened the wound as far as the levator ani, which was found united with its fellow and there was only a rudimentary trace of the sphincter muscles; so I at once closed the wound. I then performed left lumbar colostomy although Da Costa calls this a 'most unsatisfactory operation' and Gant asserts that 'because of disagreeable features and high mortality the operation of colostomy is not advisable except when the malformation cannot be relieved by proctoplasty'. I brought out the colon above the sigmoid flexure and stitched the serous coat of the bowel to the parietal peritoneum, on all sides, with catgut. Next, I opened the colon longitudinally, as a temporary measure, and finally stitched the everted margins of opened bowel to the skin all round. A sterilized rubber tube was smeared with sterile vaseline and introduced into the bowel in the upward direction for an inch-and-a-half and fixed to the skin with two stitches. The wound was dressed and the end of the tube was brought out and connected with a bottle by means of rubber tubing. Everything went on all right for two days, but on the third day during my absence my assistant on duty finding the tube blocked removed the same, and in attempting to replace it failed to find the lumen, and dislodged the colon. The child was placed under chloroform at once, and I again secured the bowel and fixed it securely in position by two layers of sutures. The baby made an uneventful recovery. Leaking of faecal matter in the urine stopped within a fortnight of the operation, the fistulous communication existing between the bowel and the bladder appearing to close spontaneously, and the patient was discharged after six weeks.



About six years later the boy was brought to me and I took the accompanying photograph. In order to relieve the boy of the discomfort of faecal incontinence, I decided to bring down the rectum and make an anus in the correct position, and then to close the artificial one; but I could not find the continuation of the rectum downwards; either the lumen was

narrowed or the canal completely obliterated beyond the artificial anus; so I was unable to complete the operation.

A CASE OF STRANGULATED DIAPHRAGMATIC HERNIA

By M. Y. KHAN, M.B., B.S., P.C.M.S.

Assistant Surgeon, Isakhel, Punjab

On 17th June, 1931, I was called to a village about five miles from my dispensary to see an injured person, S. R., a 4½ years old Hindu male child, who was the victim of a murderous attack along with certain other members of his family. I reached the place about 4 hours after the accident. The child had many wounds over his body, alleged to have been caused by a 'burchha' (spear) and a 'churi' (a long knife). He was restless with quick pulse and shallow rapid breathing. Besides many wounds, of more or less minor importance, there were two penetrating wounds of the chest.

(1) On the right side of the chest about 2 inches below the nipple 1½ inches by 1 inch externally.

(2) On the left side just below the inferior angle of the scapula ½ inch on the surface.

Air was passing freely out of both the wounds, and the subcutaneous tissues around them, especially on the left side, were swollen with air. All the wounds were cleaned and sterilized and stitched up except that on the right side which was only partially closed on account of its dirty appearance. Within an hour of the examination the surgical emphysema extended over practically the whole of the trunk, neck and face. The child was brought to the hospital the same evening. The subsequent history is briefly as follows:

From 18th June to 23rd June, 1931, his general condition improved: surgical emphysema was slowly subsiding. All the stitched wounds healed by first intention. The wound on the right side, however, became septic so that it had to be enlarged. On 21st June, 1931, a piece of cartilage was removed to give free drainage. During this period the patient was running a temperature in the evening up to 101°F.

On 23rd and 24th the child showed signs of inflammation in the chest with numerous crepitations and rhonchi on both sides, more marked on the right; temperature was 101°F. to 102.5°F.

On the 25th the temperature and signs of catarrh in the chest began to subside.

From 26th to 30th he was improving in every way, cough only occasional, chest practically clear, no fever, appetite normal, and the wound clean and healing. To all of us, his recovery seemed only a question of a few days.

Suddenly on the 30th evening he began to suffer from vomiting, anything he took was brought up immediately. Temperature rose to 101°F. During the subsequent night he was very restless with severe pain in the epigastrium and persistent vomiting, even water was brought up every time it was taken.

The abdomen was quite soft without any appreciable tenderness or rigidity and the chest was also clear. He was treated symptomatically for the pain and vomiting but to no effect. On the morning of 1st July, 1931, he was much exhausted and had the appearance of a patient after profuse hæmorrhage—very anæmic with shrunken face and feeble pulse. His condition deteriorated rapidly and he expired on the same afternoon.

On post-mortem examination the left pleural cavity was found to contain about seven ounces of hæmorrhagic fluid and a dark coloured viscus was protruding into this cavity through the left

crus of the diaphragm. This was the stomach, the diaphragm constricting it in the pyloric region so that the major portion of the stomach was herniated into the pleural cavity. The wall of the herniated portion was dusky red from extreme vascular engorgement and its cavity was full of blood clots.

It seems that the left diaphragm was injured during the stab on the left side of the chest. The weak spot thus caused seems to have given way due to some sudden strain, e.g., a paroxysm of coughing with the consequent production of the strangulated hernia.

I thank K. S. Dr. Munirud-Din, P.C.M.S., Civil Surgeon, Mianwali, for his kind permission to publish these notes.

A CASE OF ACUTE DILATATION OF THE STOMACH

By M. M. ALI ABBASI, M.B., B.S.

Medical School, Amritsar

H. S., aged 18 years, student of a local college, was brought to the medical out-patient department of the Civil Hospital, Amritsar, on 10th May, 1932, complaining of pain, vomiting and a swelling of three days duration in the left hypochondrium.

The patient looked seriously ill. He had acid eructations, great thirst, loss of appetite and bowels constipated.

The swelling occupied the epigastric and the left hypochondriac regions and conformed to the shape of the stomach.

Examination of the other systems did not reveal anything abnormal except that there was a temperature of 99.4°F.

Before coming to the hospital the patient was treated by the resident medical officer of the college with purgatives, enemas, stomach washes and local application of mustard-plaster, with no result.

Taking into consideration the definite history of overloading of the stomach, the form of the swelling and excluding other possibilities it was diagnosed to be a case of acute dilatation of the stomach and the youth was admitted to the hospital and treated on the following lines and discharged cured on 11th May, 1932:—

1. Enema saponis Oij at once with no result.
2. An attempt to wash out the stomach with soda bicarb. lotion failed.
3. Atropine sulphate 1/100 grain hypodermically, followed a few hours later by
4. Pituitrin ½ c.cm. hypodermically.
5. Normal sterilized saline Oj per rectum by drops.

On enquiry from the medical officer of the college it is reported on 13th May, 1932, that the student is doing quite well since his discharge from the hospital.

This case is of interest because acute dilatation of the stomach is rare and is generally fatal. The cause of dilatation in this case was probably reflex spasm of the

pyloric sphincter as it readily yielded to the hypodermic injection of atropine sulphate.

I have to thank Dr. G. D. Kapur, M.C.M.S., Second Physician, Civil Hospital, Amritsar, for his kind permission to publish this note.

AN UNUSUAL CASE OF FOREIGN BODY IN THE AIR PASSAGES

By K. M. LAL, M.B., B.S.

Medical Officer on Reserve Duty, Ludovic Porter Hospital, Meerut

(With the kind permission of Major D. Clyde, I.M.S., Civil Surgeon, Meerut)

NIHAL aged 63 years presented himself on 25th November, 1931, with a swelling on the left side of the chest in the region of the fifth rib in the mid axillary line and with a history of having accidentally swallowed a fairly big *daton* stick nearly six months back, while he was cleaning his teeth.

Physical examination.—Left side of the chest wall moved less than the right and a swelling was seen in the region of the fifth rib in the mid axillary line on the left side. The swelling was hard, and very tender.

Vocal fremitus was increased on the right base. The left base was dull as compared with the right and breath sounds were deficient on the left base.

The patient had a very persistent cough with bloody expectoration. He was running a temperature of 99°F. He was sent to the British Station Hospital, Meerut, for a skiagram with a provisional diagnosis of periosteal sarcoma of the rib.

28th November, 1931. The radiologist sent the following report:—

The tumour throws a shadow but no definite structure and the base of the left lung shows consolidation.

30th November, 1931. Resection of the rib was done under local anaesthesia (2 per cent. novocaine). After resecting the rib the subjacent area was further explored by blunt dissection and after going through the pleura, resistance was felt by the operator and on further probing, a cylindrical stick 9½ inches long was taken out from the lung tissue. Along with the stick some foul smelling fluid came out. The wound was packed with eusol gauze.

The wound was dressed with eusol alternated with acriflavine lotion (1 in 1,000). Foul smelling pus used to come out, but the wound gradually began to granulate. The cough and temperature persisted but the patient appeared to be making a slow recovery when he developed a pain in the right hypochondrium. Emetine did not improve his condition and an exploratory needle was inserted and chocolate coloured pus was found.

The patient refused to remain in hospital longer so was lost sight of.

This case is of interest from the following points:—

- (1) The size of the foreign body and the distance it had travelled through the lung.
- (2) The length of time (six months) it remained *in situ* without producing gangrene of the lung.

NOTES ON TWO UNUSUAL CASES OF STONES IN THE BLADDER

By KHAN BAHADUR AHMED BAKESH, I.S.O.
Assistant Residency Surgeon, Indore

Case 1.—An old man aged 60 years was admitted to the King Edward Hospital on 28th February, 1932, for painful defecation and painful micturition for the last two years.

On examination; he had prolapsed and inflamed piles, enlargement of prostate and stone in the bladder.



He was a very old man with a weak constitution and as a routine the following tests were carried out:

- (1) Blood pressure 100 to 130 mm. Hg., by auscultation.
- (2) Blood coagulation time 3 m. to 45 sec.
- (3) Residual urine—one ounce.
- (4) Urea concentration in urine 3 per cent.
- (5) Blood cells and pus cells were present in the urine.

He was operated on on 2nd March, 1932, by the suprapubic method and 12 stones weighing 3 ounces were removed. Litholapaxy was not done because the man was very old and had bad cystitis. The largest number of stones so far removed is 9, according to Nelson's loose leaf surgery, while in this case 12 fair sized stones were removed. They were all smooth and faceted (*see figure*).

The laboratory report shows that they are mostly phosphatic with a uric acid nucleus. The suprapubic wound healed and the patient was discharged on the 21st March, 1932.

I am indebted to Col. R. F. D. MacGregor for his kind permission to publish this case.

Case 2.—A child aged 18 months was admitted to the King Edward Hospital on 2nd May, 1932, with symptoms of stone in the bladder, of six months duration. On sounding the bladder

it was found that the stone was of large size and filling the whole viscus. A suprapubic lithotomy was done and three stones were removed. The weight of these is 4 drams 40 grains and the laboratory report shows that they are phosphatic with a uric acid nucleus. The naked-eye appearance of these stones is the same as those of the 12 stones previously removed.

The usual practice in this hospital for stone is litholapaxy, as it is the mother institution for litholapaxy in children ever since the time of Col. D. F. Keegon, and all stone cases are operated on by this method except those where clear indications for lithotomy exist.

In both these cases suprapubic lithotomy was done.

The cases are of interest as the incidence in one case is in a very old man aged 60 years and in the other a child aged 18 months.

A CASE OF GRANULOMA INGUINALE

By J. N. GHOSAL, L.M.S.
Basirhat

Previous history.—M., aged 30, noticed a bubo on his left groin and within 4 or 5 days a superficial small broken pimple on the corona of his penis, in August 1930. A local doctor administered antisyphilitic treatment and opened the bubo after three weeks. No pus was detected in the bubo and the wound began to spread on all sides. Multiple nodules and pimples also appeared on his penis, pubis and scrotum and these turned into sloughing ulcers. He took mercurial fumigation and various remedies but the ulcers proved intractable.

The writer saw him first in February 1931. He presented one continuous sloughing ulcer from the pubes to the anterior superior spine of the ilium, extending down between the thigh and the scrotum to within an inch of the anus, besides multiple ulcers on the body of the penis and scrotum. All the ulcers had raised, puckered and everted edges and the bases were covered with a tough whitish slough from which there was a continuous oozing of offensive discharge. The writer gave him a course of tartar emetic injections and the ulcers were dressed with bismuth-acriflavine paste. As no improvement was noticed within three weeks, the writer removed all the sloughs from the ulcers, under chloroform, after which they looked exceptionally clean and healthy. There was no involvement of the glands or even the tissues underneath the fascia.

The patient was advised to continue the injections but he gave them up and tried to recover by means of home-made oily applications. Within two months the operated area healed completely but the disease began to spread below and to the sides by means of raised, inflamed skin over which numerous nodules and pimples formed the vanguard of the extension. The patient underwent another

course of mercurial fumigation, neosalvarsan and anti-syphilitic treatment without result. After about one year he placed himself again under the writer's treatment; this was in March last.

Injections.—A course of typhoid vaccine 1,000 m., beginning with 2 drops and up to 2½ c.cm., mixed with saline solution, was given for a month. The effect was a complete cessation of the discharge. The small ulcers healed within one month; but there was no further progress regarding the huge inguinal ulcer. At this time the whole area had been compressed with acriflavine solution 1 in 4,000 and B. A. P. (Bismuth-Acriflavine-Paraffin Liquid) applied.

As there was no further improvement, B. A. P. was changed to Deek's ointment which cleaned the ulcers of the tough slough within a week. But the wound showed no sign of healing. A course of tartar emetic injections of 1 per cent. solution, 1 to 6 c.cm., was regularly given on every fourth day and B. A. P. was again substituted.

On the request of the patient three sodium thiosulphate injections have been given to 'eradicate the effect of mercury from his body'.

The whole course of the treatment and complete healing have taken over three months. Internally he was given tonics.

Medical News

THE PARKES MEMORIAL PRIZE

The prize of 75 guineas in money and the Gold Medal of the Parkes Memorial Prize for 1931 has been awarded to Captain D. C. Ettles, M.B., R.A.M.C.

Current Topics

Skin Diseases in General Practice

By ROBERT GIBSON, M.D.

(Abstracted from the *Practitioner*, Vol. CXXVIII, March 1932, p. 271)

SKIN diseases in general practice may be divided, broadly, into the parasitic and the non-parasitic. In a short article it is only possible to give suggestions which may be of help to the practitioner in the diagnosis and treatment of the more common diseases. Frequently a good remedy is tried in a haphazard fashion without instructions having been given as to its use. A minute or two spent in giving directions often means the difference between success and failure. How frequently is rest in bed overlooked in treatment of the skin. Inflammations of other important organs are so treated, but inflammations of the skin do not receive the same obvious consideration. Then, again, sepsis, so frequently the power behind the disease, if not the actual cause, is forgotten. Surgical cleanliness must be insisted on if good results are to be obtained.

Animal parasites

The great difficulty in dealing with these pests is the liability to re-infection. They are more common in winter and usually more than one member of a household is infected. Scabies does not occur above the collar except in the infant, when the back of the neck and scalp may be infected from the mother's arm. As

important as local medication are stoving and disinfection of clothing and bedding. Without these cure cannot be obtained. Gloves should not be overlooked in scabies treatment.

Vegetable parasites

Tinea capitis.—Diagnosis is easy, but confirmation can be obtained by microscopic examination of the stumps or by examining the scalp under Wood's glass, attachment of which for the mercury vapour lamp costs only a few shillings. Under this, infected hairs give a greenish-yellow colour which cannot be mistaken. Previous application of iodine invalidates this test. Ringworm of the scalp is rare above the age of 16. Treatment consists in epilation either with x-rays or by administering thallium. Rubbing in ointment in the hope of cure is tedious, both to the patient and parent and of questionable benefit. In the hands of the expert x-ray epilation is devoid of risk, and cure is obtained in under three months. Thallium is suitable for those who cannot keep still for x-rays—usually the very young. The dose, 8.5 mg. per kilo. body-weight must be carefully calculated, and epilation occurs in 20 days. The disadvantage is the rapidity with which re-growth takes place, favouring re-infection. After epilation the scalp is examined weekly under Wood's glass to watch the progress of the case and to remove infected stumps. A washable cap should be worn during treatment and the scalp anointed with ung. hydrarg. ammoniatum.

Tinea circinata.—In this the lesions are in rings, sometimes concentric, and in plaques. Diagnosis can be confirmed by microscopic examination of scrapings in liquor potassæ. In ectothrix infections the source can usually be traced to animals. Such lesions may be vesicular or kerionic, especially in the beard area. Ringed eruptions on the groins, thighs, gluteal cleft and axillæ must always be suspect; here infections spread rapidly because of the moisture and warmth.

In ringworm between the toes the epidermis looks sodden, and painful cracks develop on the plantar aspect. A superadded eczema may appear on the adjoining skin. In recurrent tinea of the trunk or limbs the toes should be examined for the source of infection. It is not always easy to find the fungus in scrapings from the toes. *Tinea unguium* may spread from the surrounding skin, making the nails look brittle and opaque. Treatment of tinea circinata is simple and effective. Wash with soap and water and rub in ung. hydrarg. ammoniatum. Painting with tinct. iodi to cause exfoliation is useful.

Whitefield's ointment—

R̄ Acid. benzoic	..	..	grs. xxv.
Acid. salicylic	..	..	grs. xv.
Paraffin. mol.	..	..	℥ii.
Ol. cocois nucis ad	..	..	℥i.

will clear ringworm of the groins and from between the toes. The ointment should be rubbed in night and morning after removing the sodden epidermis. Kerionic ringworm is treated as a septic condition as pustulation kills the fungus. Epilation of the beard area with x-rays may be necessary.

Pityriasis versicolor, due to the *Microsporon furfur*, is most frequently seen on the chest and intrascapular regions. It occurs in yellow or brown patches in those who perspire freely and do not change their underclothes often. The fungus can always be found. Washing with soap and water to remove the scales and rubbing in sulphur-salicylic ointment or vigorous rubbing with sodium hyposulphite lotion, ℥i to ℥i, will cure it. Frequent changing and disinfection of the underclothes are necessary.

Microbic infections

Streptococcal and staphylococcal infections account for the largest number of cases of skin diseases. Streptococcal lesions are acute and vesiculo-pustular, staphylococcal are subacute and folliculo-pustular.

Streptococcal infections are local, except when lymphangitis develops, while staphylococcal ones tend to lower the body resistance and become chronic.

Streptococcal infections—*pemphigus neonatorum* and *impetigo contagiosa*—are easily cured by local treatment, namely, opening the vesicles, removing crusts and scabs by starch poultices and cleansing with oil, and dabbing on the following:—

R̄ Zinc sulphate	..	..	grs. vi.
Copper sulphate	..	..	grs. iii.
Aquam. camph. ad	..	..	℥i.

The organism is not resistant, so 'strong' applications are unnecessary. Ung. hydrarg. ammon., 2½ per cent., acts well, but must be rubbed in and applied on lint after cleaning.

Staphylococcal infections—*sycosis barbæ* and *pustular folliculitis of the scalp and thighs* are difficult to cure and liable to recur. In sycosis the hair should be cut short, not shaved, and the parts flushed daily by prolonged hot bathing. Rubbing in night and morning the following ointment is useful:—

R̄ Sulphur	..	..	grs. xx.
Hydrarg. sulph. rub.	..	..	grs. v.
Ung. zinci ad	..	..	℥i.

Epilation with x-rays is of great service in the chronic stages. Tonics and change of air are helpful, as are also daily exposure to the carbon arc lamp. Vaccines are only occasionally helpful. In pustular folliculitis of the scalp in the young thallium epilation may be tried if ointments fail.

Furunculosis.—In furunculosis attention to the general health is essential. Early opening is not advised, but application of Unna's mercury and carbolic plaster is useful. Yeast, especially fresh brewer's yeast, is of help, but calcium sulphide has proved valueless with me. Autogenous vaccines are sometimes wonderfully successful, as are also injections of colloidal manganese every four or five days.

Seborrhæa.—The seborrhæic skin is dull and greasy, affording a ready soil for the growth of bacterial parasites. Many members of a family are often affected and the tendency is hereditary. It appears as the greasy scale on the infant's scalp, which later shows as pityriasis capitis or dandruff. The skin of those suffering from dandruff is often affected with seborrhæic dermatitis; it is liable to attack and spread from the central line of the body. The axillæ and groins are often the seat of a resistant type of the disease. On the trunk it appears as a folliculitis or in circinate patches, which have to be distinguished from pityriasis rosea and tinea versicolor. Thorough treatment of the infant's scalp would prevent many of the later seborrhæas. It should be washed daily and the following ointment rubbed in:—

R̄ Sulphur	..	..	grs. x.
Acid. salicylic	..	..	grs. x.
Camphor. carbol.	..	..	m xx.
Paraffin. mol. ad	..	..	℥i.

For the pityriasis of later life weekly washing with spirit soap and daily application of the following is satisfactory:—

R̄ Euresol.	..	..	℥ii.
Hydrarg. perchlor.	..	..	grs. ii.
Ol. ricini	..	..	q.s.
Industrial spirit to	..	..	℥vi.

For the trunk the sulphur-salicylic ointment acts well, but if acute a paste is preferable, such as:—

R̄ Ichthyol.	..	..	m xx.
Sulphur	..	..	grs. x.
Zinc paste to	..	..	℥i.

Cotton or linen must be worn, not wool.

Acne vulgaris.—Closely allied to seborrhæa is acne vulgaris, which attacks the face and upper parts of the trunk in adolescents. The age factor is important, and intestinal disturbances may be present. Comedones

are always present, some of which inflame, giving the typical acne pustules. These, when healed, leave a scar. Marked atrophy and pitting may occur without much pustulation. The halogens give an eruption simulating this disease. In treatment the general health should be attended to and exercise in the open enjoined. Local treatment consists in long continued daily bathing with hot water and soap. The lather, if rubbed dry and left overnight, causes a gentle scaling which is helpful. This is preferable to ointments, which young people find irksome. Daily application of the following is helpful:—

℞ Potasse sulphurate.
Zinc sulphate. ..
Calamin aa ʒi.
Glycerin ʒ xxx.
Aquam. ad ʒiv.

Vaccines will occasionally be found useful. Small doses of x-rays, especially in the indurated type, are often of value. Erythematous doses of the mercury vapour lamp are suitable for acne of the trunk. For the greasy, shiny face Sabouraud's lotion is useful, namely—sulphur precipitate 4 per cent. in bisulphide of carbon. The lotion is explosive if brought near an open flame and smells badly. It is best put on in the open, when the smell rapidly disappears.

Acne rosacea is a chronic affection of the face of spirit drinkers and, more frequently, immoderate tea drinkers. Ulceration of the cornea is sometimes seen in this condition. Regulation of diet with application of the potassa-zinc lotion during the day and nightly rubbing in the following ointment will be found useful:—

℞ Sulphur grs. x.
Ichthyol. ʒ xx.
Resorcin. grs. xv.
Ung. zinci ad ʒi.

Tuberculosis of the skin

Scrofuloderma, associated with deep tuberculous lesions, and lupus vulgaris are the common forms of tubercle in the skin. Scrofuloderma is most common in the neck, but lupus, whilst it may occur anywhere, is most common on the face. It starts as a small nodule with an apple-jelly appearance through the diascop. It is usually single and the spread is by peripheral growth. In lupus affecting the nose the nasal mucosa should be examined. Diagnosis of the initial nodule is most important as cure can be effected by excision. The later manifestations can only be treated in clinics.

Non-parasitic group

Dermatitis includes eczema and inflammations due to occupation. They start as an erythema and may go through vesiculation and pustulation or become chronic. Trade dermatitis should clear on removal of the cause, though cure is often delayed. In treatment, protective dressings should be constantly applied and, if acute, rest in bed is desirable. Protection from strong winds and sunlight is necessary. While attention to the general health is essential, local applications offer the best means for relief and cure. In acute cases lotions applied as wet dressings, without protective covering, soothe by evaporation.

℞ Liq. plumb. subacet. .. ʒiii.
Zinci oxid ʒ.
Pulv. amyli aa ʒss.
Aquam. ad Oj.

is useful. For night, linimentum calcei cum calamine is preferable. Crusts and scabs should be softened with a starch poultice and removed with oil before dressings are applied. When exudation ceases, Lassar's paste acts well; ichthyol, 4 per cent., and, if itchy, camphor. carbolatum, 5 per cent., may be added. Tar paste is often useful, even in the acute facial eczemas of children.

℞ Coal tar and zinc oxide .. partes ii: mix.
Pulv. amyli and paraffin. mol partes xvi: mix.
Then mix both.

A tar washed free from alkali is essential. This paste is also useful in chronic eczema. X-rays, in small weekly doses, are helpful in chronic itchy eczema.

The erythemata or toxic eruptions may be due to drugs, absorption of toxins or perverted digestive processes. The redness disappears on pressure, which distinguishes them from purpura. In *erythema multiforme* the eruption is symmetrical, favouring the extensor aspect of the limbs, purplish red in colour and polymorphic, sometimes bullous, in character. In many cases the buccal mucosa is affected. It must be distinguished from urticaria, and the bullous type from dermatitis herpetiformis. Recurrences are common. Treatment is general and locally calamine lotion relieves the burning itch.

Urticaria is the commonest of the erythemata; it occurs at any age and is due to a multiplicity of toxins. The urticarias of children are usually due to digestive disturbances and treated accordingly. In adults visceral disease, glycosuria, Bright's disease, etc., may cause it, but after excluding all such causes, a group remains which is difficult to deal with. It is in this group that removal from home surroundings and observation in hospital is advisable. Milk diet, diluted if necessary, for a week will often clear the symptoms. At the end of the week one article of diet is added every two days in the hope of locating the offending article. Milk itself may have to be excluded by putting the patient on a rice diet. Careful search for septic foci must be made. Autogenous vaccines from cultures of the stools, if an extraneous organism is found, are sometimes helpful. Auto-hæmotherapy is of help; 5 c.cm. of blood is taken from the arm and injected immediately into the buttock. For relief of symptoms, cotton or linen is worn, and the following may be tried:—

℞ Sulphur grs. x.
Camphori carbolat ʒ xxx.
Paraffin. mol. ad ʒi.

Menthol, grs. ii, may be added. To secure sleep anti-pyrim or luminal may be given.

Lupus erythematosus begins as a macule on the face, spreads peripherally and gives rise to the bat's wing appearance, with scarring in the centre. The lesion may be verrucose or covered with a fine scale which, on removal, shows plugs on the under surface. Around the edge of the lesion plugging is seen. Pyorrhœa and septic conditions of the naso-pharynx, if present, should be dealt with before other treatment is begun. Intravenous injections of 1 to 5 c.cm. of a 0.1 per cent. solution of gold chloride will often clear the disease. Krysalgen or solganol may be tried, and also intramuscular injections of bismuth with rubbing in bismur-ung ointment. Calamine lotion is useful as a protective dressing. The disease is liable to recur on exposure to strong winds and sunlight.

Erythema pernio or chilblains are seen in the young and those with poor circulation. Hygienic measures should be adopted and cod-liver oil prescribed. Oral administration of calcium has proved useless to me, but intramuscular injections of colossal calcium are useful. Internally small doses of thyroid extract are of help. Locally, ung. iodi denigrescens or menthol ʒi, in ung. zinci ʒi, gives relief. If the skin is broken 2 per cent. acid carbolie in ung. zinci is helpful.

Erythematous-squamous eruptions.—Probably no eruption gives the general practitioner so much anxiety as *pityriasis rosea*, which is often mistaken for secondary syphilis. The signal spot which appears seven or more days before the general eruption on the trunk and adjacent parts of the limbs is often overlooked. Viewed from a distance it can hardly be mistaken. The eruption is of two kinds, namely—small pink spots with fine scaling and larger almond-shaped lesions running in the line of the ribs with yellowish, papery scaling centres. There is no glandular enlargement or other signs of syphilis. Subjective symptoms vary from

little inconvenience to marked itching. The diagnosis alone is important as the disease is self-limiting and clears in about three weeks with ung. salicyl. 3 per cent. The cause of *psoriasis vulgaris* still remains hidden, so treatment must be symptomatic; it is liable to recur. In acute cases rest in bed is essential, with the application of soothing ointments. Internally, salicin or quinine may be prescribed. For the chronic eruption, chrysarobin is the best drug, and if the disease is extensive rest in bed during treatment is advisable. It is best applied in a base as follows:—

R̄ Kaolin	..	..	aa 3ii.
Pulv. amyli	..	..	5iv.
Paraffin. mol.	..	..	grs. x.
Chrysarobin	..	..	grs. x.
Acid. salicylic	..	..	grs. x.

This is rubbed in night and morning until reaction is obtained, when a soothing ointment is necessary. For the large, chronic patches x-rays are useful. Internal medication always seems problematical. Chrysarobin cannot be applied to the scalp, but the following can be:—

R̄ Hydrarg. ammon.	..	grs. xv.
Liq. picis. carbonis	..	m xv.
Acid. salicylic	..	grs. x.
Paraffin. mol. ad.	..	5i.

Papular eruptions.—Lichen planus is the most common; it appears as shiny-topped papules, which tend to aggregate and form plaques, giving a purplish or violaceous colour. The inside of the cheeks may be affected, but cannot be diagnosed here unless papules are found on the skin. Rest in bed is essential in the acute cases and removal from home surroundings is often advisable. Thorough de-intoxication of the intestinal canal by administering 1 oz. of Glauber's salts in the morning and fluids, but no solids, for 24 hours is satisfactory; next day ordinary diet is resumed. Liq. hydrarg. perchlor. or arsenic may be prescribed. Intramuscular injections of enesol are often helpful. Locally, the following relieves the itching:—

R̄ Hydrarg. perchlor.	..	grs. ii.
Acid. carbol.	..	grs. xx.
Ung. zinci ad.	..	5i.

For chronic patches x-rays are often useful.

In conclusion, the largest number of skin diseases we see are simple and yield to simple remedies. Cure-alls are not to be desired, but excellent results can be obtained from a limited number of well-chosen remedies if used in the proper manner.

Increased Carbohydrate in the Treatment of Diabetes Mellitus

By S. C. DYKE, D.M. (Oxf.), M.R.C.P. (Lond.)

(Abstracted from the *Lancet*, May 7th, 1932, Vol. CCXXII, p. 978)

STARVATION in the treatment of diabetes is not now necessary nor is under-nutrition actually desirable. By means of the judicious use of insulin it is possible to rest the pancreas without recourse to either of these measures. In the past the value of insulin in this respect has not been sufficiently realised. By the time that insulin was introduced, the general dietetic principles of Allan had been so firmly established that insulin was used merely as an adjunct to the dietetic treatment. Preliminary starvation was enforced until the blood-sugar became normal, and the diet was then slowly stepped up until it became evident that the carbohydrate tolerance had been reached. At this stage, and not before, insulin was introduced into the treatment. There was and still is a general feeling that once insulin has been introduced into the management of a case its use must be maintained throughout life. This is far from being so. The early and free use of insulin as a means of securing pancreatic rest brings the case under

control quickly and easily and without danger of ketosis; in the milder cases its use may be dropped as the glucose tolerance increases; in all cases the size of the dose necessary at the commencement of treatment always greatly exceeds that on which the case finally becomes stabilised. The use of insulin tends to reduce ketosis; starvation to produce it. On these grounds alone it is preferable to secure pancreatic rest by means of insulin rather than by starvation.

Simple rest, however, does not constitute the whole of the treatment of diabetes; the pancreas rested, and with some of its function restored, must not thereafter be overworked; it is as a means of taking some of the load from the pancreatic islet tissue that insulin has been almost solely used in the past, and its importance in this direction remains undiminished. In the past, however, there has undoubtedly been a failure to take full advantage of the possibilities offered by insulin in this respect.

The diets in use as a result of the work of Allan at the time of the introduction of insulin mostly allowed carbohydrate, protein, and fat in the approximate proportions of 50, 50, and 150. So long as the diet conformed to Woodyate's formula that F should not exceed 2C plus 1P it was considered that ketosis would not develop, and in many instances patients did well on such diets either with or without insulin; in fact, so enormous was the improvement over all previous forms of treatment that for a time it seemed that nothing better could be found. As, however, the potency of insulin was fully realised, there was questioning as to whether the low-carbohydrate-high-fat diets introduced as a result of Allan's work were really the best that could be devised, and the further the inquiry is pushed the more evident it becomes that they are not.

On clinical grounds it has now become evident that with the intelligent use of insulin strict limitation of carbohydrate is neither necessary nor desirable. It is a matter of experience that on adequate insulin dosage the patient who is not slavishly observant of his diet often does rather better than the one who adheres strictly to the letter of the doctor's word. Patients on a diet just conforming to Woodyate's formula in many instances show a tendency to develop some degree of ketosis—and no diabetic can be regarded as satisfactorily under control who shows acetone in the urine. More free-and-easy patients who exceed their diet in moderation—and when this is the case it is practically always to the carbohydrate ration that the addition is made—may escape acetonuria even though some degree of glycosuria develop, and it is a matter of common observation that the diabetic with a little sugar in the urine feels and actually is in better health than his fellow who is free of glycosuria but has acetonuria.

These considerations have led within the last few years to a considerable increase in the carbohydrate and decrease in the fat ration of the diabetic. Ever since the introduction of insulin it has been recognised that by its use in sufficient amount it is possible to balance almost any amount of carbohydrate in the diabetic diet. It was, however, widely assumed that any increase in the carbohydrate of the diet would necessitate a proportional increase in the insulin dosage, and the average patient greatly prefers to put up with a low carbohydrate intake rather than to increase the bulk and the number of his daily insulin injections. Experience has shown that the assumption that increase in carbohydrate necessitates a proportional increase in insulin dosage is entirely false. It has been widely held that one unit of insulin may be regarded as approximately sufficient to bring about the metabolism of one gramme of glucose, and within very wide limits this is true enough for the first 15 or 20 units of the dosage. Thereafter, however, it is found that increasingly large amounts of carbohydrate may be added to the diet with only a relatively small increase in the insulin dosage. Thus, after the first 15 or 20 units of insulin, a further 10 may be sufficient to enable the patient to deal with another 30 g. of carbohydrate, while the addition of a further

30 g. of carbohydrate to the diet may only necessitate a further 5 or 10 units of insulin.

Taking advantage of these facts, it is possible to introduce almost any desired amount of carbohydrate into the diet and to diminish the fats accordingly.

In the treatment of a case with higher carbohydrate diet, insulin must be used freely in the early stages; one hundred or more units per day may be required and the doses may have to be given four times in the twenty-four hours—even more frequently if there is any danger of coma. At the onset of treatment, no matter what the state of the patient, the carbohydrate content of the diet should be at least 100 g.; if the general condition is bad this may be given in the form of glucose solution flavoured with fruit juice. If insulin be used boldly and freely in the early stages of treatment, there need be no fear but that it will be possible very considerably to decrease the dose as improvement occurs. It is the aim of the writer, no matter what the size or frequency of the initial insulin dosage, ultimately to reduce it to one dose daily, to be taken in the morning. In many cases this becomes possible, but only when the insulin requirement is at or below 40 units daily. Once brought under control, many patients may be kept so on a single morning dose of insulin of up to 40 units; some patients, however, will not even tolerate this as their single daily dose, and I have never had a patient whom it was possible to keep under control on a single daily dose larger than this. Where the daily insulin requirement is less than 40 units it is usually quite feasible to concentrate the whole of this in the single morning dose, even though the diet contain up to 150 g. of carbohydrate. In such cases it is frequently desirable to arrange the diet so that the patient takes from 10 to 15 g. of carbohydrate in the middle of the morning; this may be taken as half a pint of milk, an ounce slice of bread or four ounces of fruit—all roughly equivalent in carbohydrate content.

In the management of the case it is important to ascertain early in treatment whether the weight of the patient be normal for his age and height. The normals may readily be ascertained from a height-age table. If the weight be above normal, steps must be taken to reduce it, and this may be a matter of some difficulty; to increase it is infinitely easier, but in any case the establishment of the particular diet and insulin dosage optional for any given case is not an easy matter. It is difficult—in fact almost impossible—to carry out treatment in the early stages satisfactorily except in an institution, and every effort should be made to get the diabetic, even the relatively mild case, into some place where the diet can be carefully regulated, the weight followed, and frequent determinations of the blood-sugar made.

Treatment is better commenced in bed. Roughly speaking, the average adult at rest requires from 1,000 to 1,200 calories daily, and if not overweight the patient may be prescribed a diet providing this amount and containing approximately 100 g. of carbohydrate. Of protein 1 g. per two pounds of body-weight may be allowed, the remainder of the diet being made up of fat. If the patient be above-weight the same carbohydrate and protein content is prescribed, but the fat ration is reduced as deemed advisable.

If on admission the blood-sugar is found to be high, insulin is given at once and freely, and the same applies if the blood-sugar rises on the diet. Roughly speaking, if the blood-sugar at the commencement of treatment be above 0.3 per cent., insulin may be started with a morning dose of about 40, a mid-day dose of 10, and an evening dose of 20 units. As treatment proceeds it may become evident that much larger doses are necessary, and there should not be the least hesitation about giving them, the morning dose always being kept the largest and the mid-day the smallest. Not until the blood-sugar is consistently within normal limits and the urine free of sugar is the diet increased. It is then raised to approximately 2000 calories with a carbohydrate content of from 125 to 150 g. At this stage the

patient will commence to show evidence of hypoglycemia after some or all of the insulin doses. This is a good sign; a few lumps of sugar are kept by the bedside and the patient is instructed to take one at the onset of symptoms with the nature of which he is acquainted beforehand. At this stage reduction of the insulin dosage is commenced. The mid-day dose is first reduced and then dropped, and then the evening dose is likewise reduced and possibly dropped altogether; the patient is allowed up and encouraged to be as active as possible; in hospital he is made to assist in the work of the ward; in the nursing home he is ordered out for a walk twice a day. The diet is now at the same time increased to the full caloric requirement of the subject; for those in sedentary occupations from 2000 to 2200 calories usually suffices, but for manual workers it may be necessary to increase on this; I have found 3500 calculated calories sufficient even for a ploughman in full work.

DISCUSSION

The higher carbohydrate diet possesses many advantages. It is more palatable and cheaper than the old high fat diet and approaches more closely to the diet in general use in this country. It is a comparatively simple matter to arrange for the diabetic subject a diet requiring no special cooking in the home and which he can select from any ordinary meal table when away. The use of special diabetic foods is not only unnecessary but actually objectionable.

Apart from consideration of cost, palatability, and convenience, it is further advantageous from the standpoint of the general health. The older type of diabetic diet largely depended for its caloric value on the high fat content; as pointed out above, a high fat intake in the diet tends to produce ketosis and also actually has some antagonistic effect on insulin. Further, a high fat intake tends to raise the level of the cholesterol in the blood, and there is ample though possibly not conclusive evidence that a high blood cholesterol is one at any rate of the determining factors in bringing about atheromatous changes in the blood-vessels. Arterio-sclerosis is almost invariable among diabetics of any standing, even those successfully treated on the older high fat diets, and the complications of arterio-sclerosis are among the commonest of the causes of death and disablement of diabetic subjects, treated and untreated alike. Evidence is already collecting that increase of the carbohydrate content of the diet is effective in clearing up the arterio-sclerosis and reducing the blood pressure. By Rabinowitch and his school this is attributed to the lowering of the blood cholesterol brought about by the reduction of the fat intake; Sansum and his co-workers, on the other hand, attribute it rather to the reduction of general acidity brought about by the ingestion of the large amounts of fruit and vegetables included in the higher carbohydrate diets. Whichever view of the matter be correct—and there is probably something to be said for both—it is a fact that such diets tend to produce a fall of the blood pressure and the improvement of arterio-sclerotic manifestations, and that such improvement is associated with a fall in the blood cholesterol and a rise in the pH of the urine. No diabetic patient should be regarded as satisfactorily controlled until the blood cholesterol has fallen below 180 mg. per cent. and the pH of the urine has risen to above 5.5. Sansum would have the urinary pH even higher, so as to be 'alkaline to litmus', but such pH readings, though common enough among the herbivorous, are not usual in omnivorous animals.

Rabinowitch continues to lay stress on the necessity for keeping the diabetic subject slightly under-nourished. Many diabetics, especially those of advancing years, are overweight, sometimes grossly so at the commencement of treatment, and many up to or below the normal weight at the commencement of treatment tend to become overweight when brought under control on the older high fat diets. In obese patients arterio-sclerosis is almost universal, and the insulin requirements tend to be large and to increase. It is undoubtedly in the

highest degree desirable that the diabetic patient should not be permitted to exceed his standard weight, but there is not now the least reason why he should not be permitted a diet ample both to satisfy his appetite and to supply the calories demanded by his daily expenditure of energy, no matter how arduous his occupation.

The Enema: Its Use and Abuse

By REUBEN FINKELSTEIN, M.D.

(Abstracted from the *New York State Journal of Medicine*, May 15th, 1932, Vol. XXXII, p. 577)

THE enema is chiefly administered for:

(1) The relief of constipation and intestinal distention.

(2) The local application of medicaments to the rectum and colon.

(3) The administration of absorbable medicaments.

(4) The purpose of supplying nutrition and fluids when mouth feeding becomes impossible or insufficient.

(5) The diagnosis, with barium sulphate, of obstruction and various diseases of the colon.

(6) Miscellaneous conditions.

Intestinal relief.—Constipation is the most frequent cause for the use of the enema. In this case, contrary to common belief, the solid masses are washed out only from the rectum and lower portion of the sigmoid, while the contents of the colon above the sigmoid are usually not affected. If, however, peristalsis of the colon has been stimulated, some of the contents may be forwarded into the sigmoid where they remain until a normal evacuation results or they are again washed out by another enema. Much of the relief felt by the patient after an enema is due to the expulsion of the previously retained gases. However, constipation, caused by cæcal retention which often follows appendectomy or chronic inflammation about the cæcum, will not be benefited by the enema. Physiologically, the contents of the cæcum are fluid and the addition of more fluid will not empty it, but will serve only to increase the pressure within the cæcum, thus frequently causing pain because of the resulting overdistention.

The enema, nevertheless, is of undoubted value in treating spasm of the distal portion of the colon, in sigmoid retention, and rectal dyschezia. In these conditions, the enema breaks up and washes out the faecal masses. At the same time, the hot water will relieve the spasms of the bowel.

The usual case of constipation is due to the accumulation of solid material within the sigmoid and rectum, relief may therefore be obtained by an enema of normal saline or a five per cent. solution of sodium bicarbonate. Such enemas do not overstimulate the bowel, and if the quantity is not excessive, they will not interfere with the normal peristalsis of the colon. In cases of severe impaction, however, more drastic measures are necessary. Four or five ounces of warm oil should be injected and retained as long as possible, even overnight. This is then washed out with a five per cent. solution of bicarbonate of soda or even a solution of hydrogen peroxide, one part to three parts of water. The oil is not as irritating to the intestinal mucosa as soap suds. Irritating clysters should not be administered in simple constipation and spasms of the bowel. They tend to increase the spasms and if used for any length of time will cause colitis or proctitis. Accordingly, such irritants as soap suds, ox-gall, turpentine and glycerine as a rule, should not be used in a simple enema.

The technique of administering the enema is as important as the contents. The lateral position is best; this avoids undue straining by the patient. At the same time the other organs fall away from the colon and thus lessen the pressure upon it. A short tip, or better, a catheter, should be inserted about two or three inches beyond the anus. In order to prevent undue distention of the rectal ampulla and to permit the filling of the entire colon without cramps or spasms,

the enema bag should be held no more than three feet above the patient.

The habit of using so-called colonic irrigations for the relief of constipation is of no more value than the usual enema, and under certain circumstances may even be injurious to the bowel. The introduction of the rectal tube beyond the rectum is almost impossible and its improper manipulation may injure the delicate mucous membrane. The tube can be inserted beyond the recto-sigmoidal junction only when the entire colon is filled with fluid. When the large rectal tube is introduced into a dry rectum it curls upon itself within the ampulla and is of no more value than the ordinary rectal tip used in administering the usual low enema.

The return-flow tube, which is frequently employed in colonic irrigations, contains two channels, one for the introduction of the fluid and the other for its escape from the bowel. However, this method of washing out the colon presents a serious difficulty for, once the colon has been filled, further flushing takes place only around the openings of the return-flow tube. A simple demonstration of this fact can readily be obtained in the following manner. An opaque enema must be given and retained. Then a return-flow rectal tube should be introduced, under the fluoroscope, and water allowed to flow through one side and return through the other. It will be noticed that only that portion of the opaque enema will be removed which is reached by the openings in the return-flow tube. If the return-flow tube is placed six or eight inches above the anus the rectal ampulla will remain filled as well as the entire colon above the point reached by the tip of the tube.

The distention of the colon caused by the large amount of fluid injected into it when giving a high colonic irrigation, hinders its normal peristaltic action and often markedly delays it so that very little of the fluid is returned through the colon tube. Only when the colon regains its tone will the contents be discharged. The effect desired by the so-called colon irrigation which is not obtained through the use of colonic tubes or return-flow tubes, can best be had by repeated enemas using the ordinary hard rubber rectal tip or catheter as previously mentioned.

Cleansing enemas continued for a long period of time are not advisable. They prevent proper peristaltic action of the bowel and gradually cause dilatation of the colon, at the same time removing the mucus so necessary as a lubricant to the mucosa. Such enemas should be used with other means to cure constipation and not as primary therapeutic measures.

Local medication.—In the treatment of diseases of the colon the medicaments should be applied in the form of a solution or powder. Powder should be applied through the proctoscope or sigmoidoscope and obviously will only reach a short distance from the tip of the inserted instrument.

Solutions of mild astringents, such as tannic acid, gallic acid, alkalies or weak solutions of silver nitrate; or massive doses of properly suspended acidophilus bacillus mixtures may be introduced by means of the enema. In cases of multiple polyposis, a six per cent. solution of tannic acid will produce a tanning effect on the pedicles which will then atrophy and the polyps will be expelled. When a mild astringent is required a five per cent. solution of powdered alum is often of value. All forms of colitis, dysentery, proctitis and parasitic diseases of the colon are benefited by the application of a proper enema.

Absorbable medicaments.—Such diseases as acute articular rheumatism, chorea, rheumatic cardiac diseases and sciatica are often benefited by rectal injections of solutions of sodium salicylate in large doses. On occasions, we have administered per rectum up to 250 grains of sodium salicylate in the course of twenty-four hours and have obtained remarkable results. It is well to remember that when sodium salicylate is administered per rectum and if the physiologic effects of this drug, such as head noises and ringing in the ears, are not obtained within three days, either the dose given is not large enough or the absorption is poor because of

some local disturbance and this form of treatment should be discontinued.

Nutrient enemas.—To supply nutrition and fluids to the patient in various diseases and after operations, is one of the most important uses of the enema which has been developed within modern times. After operations, especially on the gastro-intestinal tract, in shock, in coma, in gastric or duodenal hemorrhages, and in the treatment of peptic ulcers, it is often necessary to supply nutrition and fluid per rectum. This may be accomplished by the Murphy drip or the continuous Harris drip, or by the so-called 'massive' enema in which case about ten ounces of fluid or nutrient material is injected into the sigmoid and forced to remain there until absorbed.

Until very recently, the erroneous idea was held that meat juices, eggs, salts, starch, sugar, milk and fruit juices, when administered per rectum, were all absorbed by the rectal mucous membrane. We now know that this theory is erroneous, for no such ferment is to be found in the colon and organs of absorption for proteins, fats and carbohydrates, such as exist in the small intestines are not present in the colon and rectum. Only water, alcohol and crystalline material in solution, as dextrose, salts, sodium salicylate or sodium bicarbonate are absorbed by the rectum or colonic mucous membrane.

A five or ten per cent. solution of dextrose is the ideal nutrient enema. Such an enema should be given either as a Murphy drip or continuous Harris drip. It may be combined with a physiologic solution of sodium chloride or a five per cent. solution of sodium bicarbonate. Concentration of more than ten per cent. is not advisable because it may irritate the mucosa with resulting proctitis. Alcohol is readily absorbed by any mucous membrane and may be given as a stimulant per rectum in dilute solutions.

Before the administration of rectal feeding in any form, the rectum should be flushed out with an enema of a physiologic solution of sodium chloride. The Murphy drip should be given slowly, not more than 30 to 40 drops per minute. The solution must be warm and the tip of the catheter should not be inserted more than two inches above the anus to avoid stimulating the rectal walls and thereby expelling the enema.

Diagnostic enemas.—With the advent of the x-ray for diagnostic purposes another very important use was found for the enema. Barium sulphate suspended in buttermilk, or in a solution of mucilage of acacia or in any other medium which will keep the barium in suspension, is employed as an opaque enema. This mixture, warmed, should be administered to the patient under the fluoroscope. In this manner obstructions or defects in the colon can be visualized. No diagnosis of colonic diseases is complete without a proper opaque enema.

Miscellaneous conditions.—There are a number of other uses for the clyster of more or less importance. Fine adhesions which often occur after abdominal operations, frequently cause kinking of the colon with partial obstruction. These may be broken up by a properly administered enema, with the patient in the knee chest position. The obstruction is relieved and the colon returns to its original form. In acute partial twisting of the sigmoid, copious enemas will at times relieve the condition and thereby avoid operative interference. A non-incarcerated hernia may frequently be relieved in the same manner.

Fæcal impaction in the sigmoid or in the rectum may be the cause of severe cramps, due to hyperperistalsis of the colon. The confined gases above the impaction are greatly compressed by the increased peristalsis, thereby causing undue pressure within the cæcum which will elicit pain in the right lower quadrant, thus leading to an erroneous diagnosis of appendicitis. One or more simple clysters will relieve the condition and a needless operation will be avoided.

Acute obstruction with abdominal distention, vomiting and even fever may be caused by fæcal impaction. This is usually relieved by one or more irritating

enemas. In such an emergency an enema consisting of two ounces of Epsom salts, two ounces glycerine and one-half ounce of oil of turpentine in one pint of water may be administered. This compound enema may be repeated a few times until the impaction is relieved by an adequate bowel movement. In patients suffering from any type of kidney disease oil of turpentine should not be used because, if it is absorbed through the intestinal mucosa, the kidneys may be further damaged and even hematuria result.

If the impaction is above the sigmoid, copious injections of cottonseed oil or olive oil with the patient in the knee chest position, will often be of value. Occasionally in the latter condition, it may take from twenty-four to forty-eight hours before an evacuation takes place but treatment should be continued until the impaction is relieved. During this time no solid food should be given.

In patients suffering from simple acute appendicitis, a mild enema which produces no pain or discomfort may be given and repeated daily. If, however, the clyster produces pain or the patient complains of distress, the pulse rate increases or the patient experiences difficulty in expelling the water, no more enemas should be administered.

Many patients over thirty years of age, especially women, who have used the enema to relieve constipations for a number of years, literally become addicts to its use. The habit becomes so strong that the patient will not be satisfied with bowel movements induced by cathartics or abdominal massage. The treatment consists in gradually weaning the patient from its use. Proper diet and hygiene are very important. At best, very often, it takes many months to cure such patients.

The enema is a very valuable therapeutic measure. In the treatment of many diseases, it is an absolute necessity; however, if used promiscuously, with improper technique, or without thought as to its content or effect on the bowel, it may cause grave injury. At all times great care should be exercised in its use.

Reviews

MEDICINE: ANALYTICAL REVIEWS OF GENERAL MEDICINE, NEUROLOGY AND PEDIATRICS. Vol. XI, February, 1932. No. 1. Subject:—'*Bothriocephalus Anæmia*': *Diphyllobothrium latum* and *Pernicious Anæmia*.—By Ivar W. Birkeland, M.D. Baltimore, U. S. A.: The Williams and Wilkins Company. Pp. 139. Price, 21s. per volume and postage 2s. 6d. Single copy: 6s. 9d. (English Agents: Baillière, Tindall and Cox, London).

THIS publication, as the title indicates, is a review of the subject of *Diphyllobothrium latum* and its connection with pernicious anæmia. It contains a full discussion of the complete literature, however slight its bearing on the subject may be, and the text is followed by a list of 485 references which at once places the reader in possession of a means of access to all the works of any value that have been written on the subject. But the manner in which these various writings have been reviewed by the author will produce little need for the original papers to be consulted by subsequent workers. It is a pity that someone with knowledge of zoological nomenclature did not edit the parts dealing with this aspect of the subject, for an otherwise admirable compilation is slightly marred by several errors in naming of parasites. For instance, under *Diphyllobothrium latum* a list of thirteen synonyms is given and the authors and dates of all these names appear in brackets, which is obviously wrong. Then, in a list of cases with pernicious anæmia accompanied by intestinal parasites other than *Diphyllobothrium latum*, the name *Tenia mediocanellata* occurs four times although this name is now regarded as a synonym of *T. saginata*, and on two occasions

Ankylostoma duodenale (necator or uncinarius Americanus) occurs. Uncinarius as an alternative to necator is certainly a new departure in nomenclature, and the names *Oxyuris vermicularis* and *Lambliia intestinalis* are both obsolete. Apart from these slips, which have no real bearing on the value of the work from its clinical and pathological aspects, the paper is a useful publication in that it will save many hours to subsequent workers in consulting the literature, and as such it cannot fail to be of value.

P. A. M.

PSYCHOTHERAPY: ITS NATURE—ITS ASSUMPTIONS—ITS LIMITATIONS: A SEARCH FOR ESSENTIALS.—By H. Prinzhorn, Ph.D., M.D. Translated by A. Elloart, B.Sc., Ph.D. London: Jonathan Cape, 1932. Pp. 352. Obtainable from Messrs. Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 11-4.

THIS book is the first edition in English of what most readers will doubtless regard as a highly controversial and even revolutionary statement in respect to the present position of psychotherapy. Dr. Prinzhorn is one of quite a number of physicians, especially on the continent of Europe, who have reached the conclusion that the time is ripe for a thorough overhaul of current concepts of mind and body as separate entities. As Dr. Crookshank points out in the lively preface he has written to the book, the close liaison which exists in Germany between philosophy, metaphysics and the biological sciences, facilitates the transition from the traditional assumptions of Aristotelianism to the empirical-intuitive and aphoristic teaching of such philosophers as Friedrich Nietzsche. Indeed, Dr. Prinzhorn develops his discussion of modern psychotherapy as an outcome of the philosophy of Nietzsche, gaining support on the one hand from the psychoanalytical psychology of Freud, and, on the other, from the studies of personality and character made by Klages. The essence of this book is Dr. Prinzhorn's postulate that for each individual there exists a psychosomatic unity, hence the logical necessity for the integration of psychotherapy in general medicine. Dr. Prinzhorn emphasises the cardinal feature of the neurotic as one of loneliness and isolation, so that the aim of every psychotherapist should be the restoration of that feeling of security and companionship which can be found only in biological adaptation to life. Dr. Prinzhorn pays very high tribute to the part played by psychoanalytical psychology in the development of modern psychotherapy. He regards psychoanalysis as a unique thought motif of vast dynamic importance which continues to act like yeast in producing a general fermentation in every branch of psychology. At the same time, he distinguishes between what may be deemed ephemeral in psychoanalytic psychology and what may be regarded as of permanent value. He discusses the psychotherapy of the French school and reminds his readers of Janet's extraordinary gift for describing abnormal mental symptoms with the employment of a few conceptual aids, all of which Janet invests with great suggestive power. He appraises the ideology of Dubois as that of a well disposed and warm-hearted friend of humanity, who relies on the well-established old French moralist tradition which is so superlatively endowed with clear, critical and realistic sagacity. In the last section of the book, entitled 'the Practical Physician', Dr. Prinzhorn considers the necessity of some important modifications in medical curricula in view of the eventual establishment of the psychosomatic concept in medicine. Dr. Prinzhorn maintains that the strict division into pre-clinical-normal and clinical abnormal worlds is satisfactory only from the point of view of logic but by no means sensible from either the psychological or the practical point of view. He holds that every student who encounters in his first clinical year cases of illness, should be spared the painful experience of finding that all he has hitherto learned is little but empty abstractions. The student, on the contrary, should be so far familiar with the fundamental

types of pathological forms and functions in the bodily economy that he can at once assimilate with understanding what he sees in each individual case.

In so interesting and suggestive a book it is a great pity that here and there exist sentences or even whole paragraphs which have been so rendered into English as to be almost, if not quite, unintelligible. For instance on p. 197, we read: 'As in the case of so many problems of times of crisis, it would be simplest to take the interplay of the opposing motives in Nietzsche as the starting-point for discussion. Then we should at least have the assurance that the subterranean, really effective motives from the vital stratum were thrown into stronger light than those which can scarcely be overlooked, viz, the manifold and rationally super-added motives drawn from the individual historic events and the sociologically interesting tendencies of the cultural edifice'. Those who are acquainted with the admirable translation into English of say, Freud's 'Collected Papers', will be filled with hope that another and better translation of 'Psychotherapy' will soon be available to the English-speaking public.

O. B. H.

TEXTBOOK OF OPHTHALMOLOGY.—By W. S. Duke-Elder, M.A., D.Sc. (St. And.), Ph.D. (Lond.), M.D., Ch.B., F.R.C.S. Vol. I. London: Henry Kimpton, 1932. Pp. xxix plus 1124, with 1,022 illustrations including 7 coloured plates. Price, 63s.

MODERN ophthalmology has in recent years advanced enormously, first by the knowledge gained by the introduction of the ophthalmoscope, later by the study of the minute pathology of the eye and finally by improved methods of examination which resulted in the corneal microscope and the slit-lamp. With a view of recording all the recent knowledge of the eye, the author has undertaken the colossal task of writing a reference textbook of pathology. Up to now no work of this kind has been written in English so that the book fulfils a much needed want and will be much appreciated by all English-speaking ophthalmic surgeons.

The first volume consists of 1124 pages and is divided into eight sections. It is entirely devoted to the fundamental sciences which are discussed in great detail. Section I deals with the genesis of vision, the genesis of the eye and the development of the eye. Section II deals with the anatomy and comparative anatomy of the visual apparatus. Section III is devoted to the embryology of the visual apparatus, the ocular pigment and a most interesting chapter on heredity which plays such an important part in ophthalmology. Sections III and IV deal with the vascular circulation, the metabolism of the eye and the intra-ocular pressure. All the recent work on these subjects which has excited so much controversy is elucidated in detail. This section also deals with the physiology of the intra and extra-ocular muscles, the movement of the eyes and the protective mechanism. Section V deals with the physical, geometrical, physiological and biological optics of the eye. Section VI is devoted to the action of visible light on the retina in which the structural, chemical and electrical changes are described. Section VII deals with the physiology of vision, visual sensations, the physiological effects of stimulation, the anomalies of the visual senses and the various theories of vision. The last section deals with the psychology of vision, visual perceptions and the nature of perception.

The extensive bibliographies in each chapter give one an idea of the magnitude of the work which the author has undertaken to keep pace with new ideas.

The volume is so admirably written, so up to date, so well illustrated, that there is nothing left to criticise. A new and interesting innovation in the way of reproducing the portraits of the great masters of ophthalmology of all nationalities, has been carried out which provides a gracious tribute to men who will be always remembered with gratitude by those who are interested in the science of ophthalmology.

As a book of reference this textbook is unique and is undoubtedly the best work of its kind that has yet

been produced in any language. To ophthalmologists working in India we strongly recommend the book and look forward to the early publication of the remaining two volumes.

E. O'G K.

VITAL RECORDS IN THE TROPICS.—By P. G. Edge. London: George Routledge and Sons, Ltd., 1932. Pp. 167. Price, 7s. 6d.

THE value of demography has been known from the earliest times. In modern times, the earliest reliable records are the parish records instituted in England in 1538, and the London Bills of Mortality. Captain John Graunt, the Father of Statistics, showed to what valuable uses such records could be put in his classical 'Observations made upon the bills of mortality' in 1662. Since then every civilized country has endeavoured to obtain correct numbers in regard to population, births, deaths and marriages, and disease incidence. On the correctness of such records depends our appreciation of national health, and of the urgent problems requiring attention and action. Such accurate information is no less necessary in less advanced communities, but is notoriously difficult to collect. In Bengal some years ago Dr. B. B. Brahmachari made a detailed investigation into the accuracy of the vital statistics as registered in one of the rural areas. He found that in the registration of births errors up to 50 per cent. are common, and in the number of deaths about 35 per cent. was a common deficiency. Similarly Dr. Bentley estimated that the registered birth rates of Bengal as a whole might be taken as deficient to the extent of about 30 and 20 per cent. respectively. Among the primitive tribes of Africa in many instances little or no information of such records is forthcoming, though year by year, thanks to continued efforts particularly of the health organisations, matters are tending to improve. Indifference, suspicion, prejudice, religious beliefs, habits and customs are amongst the main obstacles.

In his book Dr. Granville Edge has illustrated interestingly the difficulties of the collection of records, and gives many useful hints as to how these may be anticipated and overcome. Most of the information would appear to refer to Africa, but much of it might be made applicable to India. The bibliographies particularly are valuable. The collection of vital statistics in India at present is divided between the police, the public health department and the local authorities, and Dr. Edge's advice will be found useful to all. The book is interesting to read, though we could have done with less of the ordinary matters (such as the simple arithmetical methods found in any textbook on public health), and more of Dr. Edge's personal experiences. The instances of the over zealousness of a certain census inscriber anxious to air his English are amusing. Certain occupations were returned as 'applying medicine to his syphilitic sores', 'dependent thief', 'drinks his mother's milk'. The man returned as 'an aperient' was a puzzle until it was discovered that 'apiarist' was meant. Under literacy appeared the entry 'cannot read or write but plays a drum'. The book is, we consider, well worth reading.

A. D. S.

SPECIFIC CHANGES IN THE BLOOD SERUM: A CONTRIBUTION TO THE SEROLOGICAL DIAGNOSIS OF CANCER AND TUBERCULOSIS.—By S. G. T. Bendien. Translated by A. Piney, M.D. London: William Heinemann (Medical Books), Ltd., 1931. Pp. xii plus 95, with 64 illustrations and 5 spectra in the text and on 8 plates. Price, 10s. 6d.

THE contribution of the laboratory to the diagnosis of cancer has up to the present been practically nil. The first attempt to attract any serious attention was the complement fixation test worked out by von Dungern whose results were certainly very striking. As no confirmation of his results could be obtained by other

workers his test never came into use. While according to our present knowledge cancer appears to differ in important respects from other diseases, it is not impossible that it may have as its basis a metabolic factor which is capable of serological demonstration. The exceptional experimental powers possessed by von Dungern may partly account for the fact that other workers were unable to confirm his results.

Considerable further impetus has been given recently to this problem by the publication of Dr. Bendien's work in his small book of 95 pages on *Specific changes in the blood serum*. As its title indicates, it is not solely concerned with the serum diagnosis of carcinoma, though this is the main interest of his researches. Its subject-matter is complicated and his method of exposition far from clear. He describes two tests by means of which he believes that special properties of the carcinoma serum may be demonstrated. These are, firstly, a precipitation test and, secondly, a spectrographic test.

The technique of his precipitation test appears to be simple enough. He first prepares twenty solutions containing varying quantities of sodium vanadate and acetic acid. These are numbered serially and vary in pH from 3.3 to 5.4, and he examines their precipitating powers on the serum. To carry out the test 0.5 c.cm. of serum is thoroughly shaken with an equal volume of water. Then 5 c.cm. of the reagent are added and the mixture again well shaken. The precipitation, if any, is observed both at once and after 24 hours without shaking between the two periods of observation. A series of graphs is then prepared showing as abscissæ the numbers of the reagent solutions and as ordinates the height of the precipitates obtained or, given test tubes of uniform dimensions, we may substitute the volume of the precipitates. He finds that normal human serum usually begins to flocculate with solution No. 6, reaching a maximum between Nos. 13 and 15, and that inactivation of a normal human serum leads to a 'shift to the right', i.e., flocculation commences in tubes 7 or 8. That is to say, normal human serum requires a solution of higher pH to initiate precipitation after inactivation than it does before inactivation. If this is proved to be outside the limits of experimental error it is of importance as throwing some light on the processes taking place during inactivation, a matter about which very little is known. He further finds that with certain pathological sera, more particularly those of cancer, this shift to the right after inactivation does not occur, and the diagnostic test is sought to be based on this difference. He further attempts to associate these differences in precipitability with protein changes in the serum and uses the term 'normal labilin' to designate that globulin fraction which is precipitated from active serum, but not from inactivated serum. He goes on to say that the 'labilin' is present in very varying amounts in different persons, a statement somewhat difficult to harmonise with his finding that the flocculation of normal sera takes place within more or less fixed limits with his series of precipitating solutions.

He has also developed a second test which is based on spectrography of solutions obtained by dissolving the protein flocculated in the first test in a weak solution of acid sodium carbonate. For this purpose he uses the Zeiss chemical spectrograph and searches for possible distinctive features in the ultra-violet region. He notes the importance of excluding the visible spectrum and accordingly he centrifuges the solutions thoroughly to remove the last traces of erythrocytes. It may accordingly be questioned as to how far such a test would be applicable to blood sera which are at all hæmolyzed.

This work breaks new ground and it is possible that facts of importance have been discovered. It is the more unfortunate that the presentation of the results is so lacking in method and the difficulties of the translator must have been great. As the work is complicated technically the results would have been more intelligible had the author opened his book with a summary of his previous publications on allied questions.

These are referred to in the bibliography, but these reports will be accessible to few.

Not satisfied with the solutions first prepared for the precipitation test, he subdivides the quantities of the solutes still further, though nothing is said as to the possible margin of error involved by the use of solutions so very similar in strength. The author's style is extremely disjointed and close attention is essential if his main idea is not to be lost sight of. Some statements made are, to the reviewer at least, quite incomprehensible. For example, on page 67, among a statement of results, it is said that 'In twenty-five cases of serum with no toxic symptoms flocculation started at No. 7'.

No information is given as to whether these are normal or pathological sera, or if the latter from what disease. As the section in which this statement is made deals chiefly, though by no means exclusively, with carcinoma and tuberculosis, it may have some connection with these two diseases. Again, it is stated on p. 68 that 'In carcinoma and tuberculosis, flocculation always occurs in low numbers, and invariably below No. 6'. On the following page, however, we find it stated that 'a disposition to tuberculosis is associated with flocculation under No. 6, and is, therefore, on the acid side. In carcinoma the tendency is manifested by flocculation on the alkaline side, that is above No. 6'. Unless we are to believe that a tendency to a disease gives results opposite to those of the disease itself, a contradiction, in so far as carcinoma is concerned, would appear to be involved here. It is evident that the author's findings require to be properly arranged. The work is marred, also, by too wide an ambit. It would have been better had the author confined himself for the present to a thorough study of the serology of one or two diseases from his special point of view, rather than carrying out so wide a survey before the implication of the tests is more defined.

The work bears evident marks of translation, a matter no doubt very difficult to avoid in a complicated technical work of this kind. Some of these might be rectified in another English edition, e.g., the word 'Essigs' in figure 1 should be replaced by its English equivalent.

R. B. L.

A NEW THEORY OF CANCER, AND ITS TREATMENT.—By C. F. Marshall, M.Sc., M.D., F.R.C.S. Bristol: John Wright and Sons, 1932. Pp. 53. Price, 3s. 6d.

THE object of publication of this little brochure is not very clear, but we suppose that the author wishes to propound his views for the instruction or criticism of others. These are given in seven statements, which are put forward without a single particle of proof—observed data or experimental results—in their support. They may be regarded as axioms, inspired by some internal light of genius. In order to do the author justice, we may quote these verbatim.

(1) That the primary origin of both carcinoma and sarcoma is embryological, or foetal, and connected with the chorionic villi, but that for the development of either carcinoma or sarcoma a secondary factor is necessary, and that is, the presence of leucin in the blood.

(2) That in the case of carcinoma a third factor is essential—the formation of a form of ferric oxide in the tissues by the action of leucin.

(3) That carcinoma is an alternating process of cell formation and cell destruction depending on the alternate formation and decomposition of this ferric oxide, and associated with an alternating production of leucopenia and leukæmia.

(4) That sarcoma is a continuous process characterized by lymphocytosis with no such alteration of remission and recrudescence, which explains its more rapid growth and greater malignancy.

(5) That in the later stages of the cancerous process with tumour formation the original biochemical changes become modified or suppressed, and the tumour assumes the character of an independent parasitic growth.

(6) That both carcinoma and sarcoma can be diagnosed in the early or precancerous stage by the detection of changes in the serum.

(7) That both are capable of being eradicated by appropriate treatment at this stage, the prognosis being more favourable in the case of carcinoma owing to its alternating course of development.

Having thus laid down his main thesis, the author proceeds to discuss the pathology, biochemistry, and 'systematology' of carcinoma and sarcoma. Some amazing statements are made, such as that carcinoma of the uterus in multiparæ is usually of the type of chorion-epithelioma. 'Carcinoma is an affection of the hæmopoietic system, sarcoma of the leucopoietic system'; a statement made without any particle of evidence brought forward in its support. 'In carcinoma the active agent in the process is the ferric oxide, in sarcoma it is the sarcomatous toxin'.

Early diagnosis, claims the author, can be established by testing the reaction of the serum to polarized light—the serum becoming levo-rotatory in malignant disease; the flocculation test is positive in carcinoma (though no details as to what flocculation test is employed are given); the urine in carcinoma may show crystals of leucothæmic acid 'which are diagnostic of cancer'.

We are thus led to the final sections on treatment; in carcinoma the main line of treatment is intravenous injections of a specially prepared ferric chloride solution in a colloidal state, supplemented by radium, and local and general measures. In sarcoma intravenous injections are given of a preparation which the author names 'Yersin' after its discoverer, though we wonder whether the well-known discoverer of anti-plague serum would sponsor this new product. It is stated to be an oxidation product of formaldehyde obtained by the action of sulphuric acid, but it is an unstable compound and consequently cannot be given a definite chemical formula. Serum treatment with the sera of horses injected with the blood of sarcomatous patients may also be tried. Local injections of hydrogen peroxide in isotonic saline, and radium. One would here expect some case reports, but none are given.

We doubt whether the publication of this book will aid at all in the study of one of the most difficult medical problems of to-day.

CANCER; CIVILIZATION; DEGENERATION.—By John Cope. Pp. 293, with 55 illustrations. London: H. K. Lewis & Co., 1932. Price, 15s. net.

It is very difficult to 'place' this book. The author is presumably a medical man, and in his preface he states that he writes for medical men, though the style adopted is far more suitable for the layman. If the book is intended to warn the lay public of the vicious cycle involved in the three processes, civilization, degeneration, cancer, then it is too prolix; if, on the other hand, it is intended chiefly for medical readers, then it is far too long a sermon to the already converted.

In brief, the book is a clear presentation of our knowledge of cancer up to about the year 1900. 'Back to the nineteenth century' is the author's motto, indeed in places he goes back to Celsus, and his title pages abound in quotations from biblical, Shakespearian and other sources. He considers that the immense volume of medical research work carried out on cancer in research laboratories during the present century represents so much wasted effort. Hecatombs of mice have been sacrificed, but we are not one iota 'further'. There is just sufficient truth in his onslaught on the laboratory worker to arouse a smile, for instance his description of how it now needs a hyperspecialist to explain to the specialist the line of study which should be pursued. It was the great men of the nineteenth century who almost solved the cancer problem by their clinical observations, and only the merest gap in their knowledge now requires to be filled in to give us mastery of the problem; here the words *almost* and *gap* need to be emphasised, because the author defines neither; how near to the complete solution the former observers came, we are not told, nor is the gap filled in.

Despite the disappearance of certain diseases with civilization and town planning, writes the author, other diseases are on the increase. (That the increase may be apparent rather than real, and be due to better diagnosis and improved medical skill, is a suggestion which is omitted). During the Great War some 2½ million male adults were examined under the Ministry of National Service as to their fitness for active service; 10 per cent. were found totally unfit, 31 per cent. unfit, 22 per cent. unfit for severe strain, and only 36 per cent. normal. (Figures which are unquestionably true, but as there exists no similar record for any previous census, it is impossible to say whether the war figures represent an increase in degeneration with civilization or not. The newspapers of the day lamented the C 3 population of Great Britain, but the British armies which that population provided were of A 1 physique).

Having defined cancer as a disease of internal and not extrinsic causation, the author passes to the actual causes of cancer which he sums up as injury plus predisposition. The predisposing causes are then discussed at great length over many chapters, and here there will be general agreement with the author's observations, though there is very little new in them. We naturally come next to the usual picture of civilized man, stamped with all his physical degeneration and precancerous stigmata due to civilization, as contrasted with the happy and enlightened savage with his magnificent teeth, his cannibalism, his home-brewed intoxicants, his unlimited reproductive capacity, and his use of all the functions that Nature has endowed him with. This picture has been so incessantly drawn that we begin to wonder whether it is true. Are aboriginal tribes with splendid teeth and large families so free from cancer as is popularly supposed? Is care-free and happy old age so common among them; or may it not be that wars, pestilences and famines leave among the tribe an unduly small proportion of persons old enough to have reached the cancerous age? If the author had presented any data regarding this difficult problem his book would have been of far more value.

Most of the book is taken up with the relationship between irritation from whatever cause and cancer, with special regard to the digestive tract in both sexes and the generative organs in women. Inadequate use of organs is said to be one of the great causes of cancer, and the author would abolish the spoon—and all articles that are eaten with it—from the dinner table, and encourage women to give up masculinity and hurdle racing and go back to the era of large families and feminism. (How the large families are to be brought up on diminishing incomes is not suggested).

We cannot follow the author when he compares the cancer cell to the protozoan. Whatever the Protozoa may be blamed for, we cannot accuse them of causing cancer. The protozoan is a non-cellular animal; the cancer cell is a cell of metazoan origin which has taken on aberrant growth. To compare a nest of cancer cells in a scirrhus of the breast enmeshed in a matrix of fibrous tissue with the resting and encysted stage of a protozoan is too far fetched an analogy to stand.

The illustrations are for the most part of the nature of thumb-nail sketches, and many of them will appeal vividly to anyone with a sense of humour. A consideration of sound teeth is accompanied by a wonderful sketch showing the correlation of large, efficient jaws and sound teeth with a big chest and abdomen as illustrated by the Mussolini type, the Roosevelt type, a Sherpa from northern Nepal, and two British 'captains of industry'. A depressing sketch of the spoon-fed man of 1931 is contrasted with an even more appalling presentation of the completely edentulous individual of 2031. A group of facial sketches of women engaged in strenuous forms of exercise on p. 143 is worthy of Epstein, whilst on p. 145 we are shown a masculine young woman in shorts, holding an oar, talking to a feminine young man in plus fours, with long hair and no chin. On p. 147 the Aphrodite of Cnidus is contrasted with the figure of the present-day woman; surely Praxiteles did not make his wonderful Venus

quite so bulky, nor has even the cover of any present-day fashion journal achieved quite such a degree of 'bambooism' in the feminine figure.

In our opinion the author has not realised that the cancer research of the present century began where his book leaves off. As it stands, the book is a useful public health summary of what is universally admitted with regard to the general causation of cancer, but it does not carry us much further.

THE CRITICAL AGE OF WOMAN.—By W. M. Gallichan. Pp. 160. London: Noel Douglas, 1932. Price, 4s. 6d.

THIS little book is perhaps hardly applicable to Indian conditions, where, so often, the period after the menopause is perhaps the happiest in the woman's life, and when the grandmother of the family becomes in truth its autocrat, moulding family and domestic politics to a degree which is hardly suspected by the European outsider. The book, however, is one which applies especially to the middle-aged European woman in India, and as such will be of special interest to the British medical practitioner in India, and to the type of patient concerned. It is well written, well balanced, non-sensational, and not too technical.

It may seem rather surprising that the author commences his essay on the subject with the question of the onset of menstruation. Despite the freedom with which sex matters are discussed to-day, he states that in far too many instances, the child is suddenly brought face to face with this new event in her physiology without the much needed guidance and wise maternal advice that are so necessary: in consequence the monthly function becomes something of which she is ashamed, or at the best an unavoidable nuisance. And matters are not improved by the fierce teachings as to 'uncleanliness' of the Talmud and the Old Testament, on which so large a proportion of humanity are reared. We thus have established at once a bias against a more natural and more sane teaching.

Following this, the author devotes no less than thirty pages to the period 'from fourteen to forty-five', for his main thesis is that it is largely the sex history during this period which will determine the characters of the menopause. It is probable that the majority of women are as strongly sexed as the majority of men, but they are subject to a whole host of social and other repressions which hardly affect men at all. 'Modesty, which is a native quality in women, is tremendously accentuated among the civilized races, and often becomes exaggerated, or degenerates into the veiled eroticism known as prudery'. 'The denial of love and parentage to a woman of powerful emotion and sex passion cannot fail to injure, in a greater or less degree, both the psychic and physical nature. It is absurd to disguise the truth that a single life is almost intolerable to a host of women, especially after the age of thirty'.

There is thus, claims the author, a very great difference between the mental attitude of a happily married woman and an unhappily married woman or a celibate who approaches the menopause. Both have unfortunately been taught that the climacteric is necessarily a period of mental and physical storm and stress. Actually, it need be nothing of the sort, it is not infrequently associated with a beginning of calm and contented days, with a higher degree of health, and with a reinvigoration of the whole system, even with enhanced physical attractions. Hence the sensible woman will prepare the way for 'the critical age' by attention to personal hygiene, by ensuring a sufficiency of physical exercise, by avoiding constipation, by regulation of the diet, and especially a reduction of meat.

There next follows a general account of the physical and mental abnormalities which may appear at the menopause. Alcoholism is a not infrequent sequel, whilst religious ardour is often an outlet for suppressed eroticism. Women at this age will conceive an erotic mania for persons other than their legitimate spouses; elderly women will take to themselves young lovers,

will pay for their professional training, adopt them as household pets, and leave them all their worldly goods in their wills—to the despair of their families, and the benefit of the legal profession. Kleptomania not infrequently develops at the menopause, and the more difficult the act of stealing, the more rashly it is embarked upon. Hysteria is frequent. In many cases the mental and moral defects which may develop at this age may be traced to unpleasant shocks and repressions sustained during the sexual life.

Finally, the author pleads for rational living during the menopause. There is a widespread belief that at this age the wife should abstain for the future from sexual intercourse; this attitude the author condemns completely. Even marriage after the menopause may be beneficial; in the case of widows 'there can be no risk in the remarriage of a vigorous middle-aged woman who has passed through the change and taken a fresh lease of healthy life. On the contrary, the effect may be the very reverse of dangerous to health'. Finally, in certain instances, psychoanalysis may be of value for women under the age of fifty years.

And, as for old age, tastes can be cultivated, 'the exercised brain remains inquiring, active and interested to the end. Frequently the passionate love of the thirties merges into the broad sympathy and the benevolence of the aged parent. Many elderly women are less bored at seventy than they were at twenty-five'.

Emphatically a book which will interest medical practitioners, the type of patients referred to, and, possibly, elderly husbands.

THE ANNUAL MEDICAL LIST, 1932. Published by the Bengal Council of Medical Registration, 21, Old Court House Street, Calcutta.

This volume will be found useful in administrative medical offices in India, and by editors of medical journals. The introductory list of abbreviations is very helpful, for at the present day medical titles appear to increase rapidly in number; we were familiar with D. O. M. S. as standing for Diploma in Ophthalmic Medicine and Surgery (Eng.), but D. L. O. for the Diploma in Laryngology and Otology of London is new to us.

The volume contains the Bengal Medical Act, 1914, as amended in 1928. This is followed by a list of further Indian universities and qualifications which are now recognised. The bulk of the volume consists of alphabetical lists of those practitioners registered in Bengal in three groups; holders of medical qualifications granted in the United Kingdom and foreign countries; medical graduates or licentiates of the Calcutta University and of other universities in India; and other medical practitioners. It is obvious that very great care has been taken over the compilation of the list.

Those who are new to Bengal often find difficulty in struggling with the trinomial system of nomenclature adopted by Bengali families, and we remember a distinguished reviewer in London deploring the innumerable species under the genus Gupta. In this volume the nomenclature is correctly given, and we note that Das Gupta has been elevated to a separate genus.

The volume is very well got up and well printed. It should be available in every medical library in the province.

ANNUAL LIST OF REGISTERED MEDICAL PRACTITIONERS.—Published by the Burma Medical Council, 1932. Rangoon: Superintendent, Government Printing and Stationery, Burma.

This publication follows upon the usual lines. A specially useful feature of it is the list of notices on pp. 1 to 5, dealing with professional offences, sale of poisons, dangerous drugs, etc., followed by a simple code of medical ethics adopted by the Burma Medical Council and published for the guidance of practitioners. The classification of registered practitioners into three grades follows the usual custom; those registered under the Medical Acts, practitioners who are graduates or licentiates in medicine or surgery of the Indian

universities, and others; arranged in each instance alphabetically.

The year 1931 closed with a total of 1,346 medical practitioners registered in Burma.

RECENT ADVANCES IN MATERIA MEDICA.—By J. H. Burn, M.A., M.D. (Cantab.). London: J. & A. Churchill, 1932. Pp. x plus 224, with 25 illustrations. Price, 12s. 6d.

This book, though written for pharmacists in the first place, is of very great interest to the medical profession. It deals with the important subjects of sera, hormones and vitamins on which a large volume of work has been done in recent years and about which the medical profession generally is not well informed. As these represent the discovery of specific remedies as opposed to simple palliative measures, the knowledge regarding their action, dosage, method of administration and assaying is important to the practising physician. Besides sera, hormones and vitamins the author has also included chapters on vaccines, vaccine lymph, the arsenobenzene compounds and their biological tests which are of great practical value. Dr. Burn's experience in this branch is unique and the book will undoubtedly be widely read and appreciated by the medical profession in this country.

R. N. C.

MANUAL OF CLINICAL AND LABORATORY TECHNIC.—By H. B. Weiss, A.B., M.D., F.A.C.P., and R. Isaacs, A.M., M.D., F.A.C.P. Fourth Edition. Philadelphia and London: W. B. Saunders Co., 1932. Pp. 117, with 2 figures in the text. Price, 7s. 6d.

THAT this little book is deservedly popular is shown by the fact that four editions of it have been published within six years. It is very clearly and concisely written and contains an amazing amount of information in a small compass. The various sections deal with case history taking, routine physical examination of the patient, urine analysis, examination of body fluids, blood examination and grouping, examination of the gastric contents, of the stools, sputum and spinal fluid, liver and kidney function tests, test meals, routine laboratory work in the wards, and technical procedures such as collection of blood specimens, paracentesis, the method of taking the blood pressure, methods of immunization and susceptibility tests, and preparation of patients for gastro-intestinal x-ray study. To these are added an extremely comprehensive table of the nutritive values of foodstuffs—including vitamin contents—and a good index.

Only the essentials are given, and the book will be of value to the medical student in the wards, the laboratory worker, the general practitioner for reference, and even to the trained nurse. In the new edition the material has been entirely revised and much new data added. We can thoroughly recommend the book as most useful and convenient for reference and for teaching.

R. K.

INTERNATIONAL CLINICS.—Edited by H. W. Cattell, A.M., M.D. Vol. IV. Forty-first Series, 1931. London: J. B. Lippincott Company, 1931. Pp. viii plus 328. Illustrated. Price, Rs. 37-8-0 per set of 4 Vols. yearly; Rs. 9-6-0 separate volumes. Obtainable from Messrs. Butterworth & Co. (India), Ltd., Calcutta.

This is the fourth volume of the forty-first series of the *International Clinics* which is an American quarterly devoted to clinical lectures and original articles. The various papers cover a very large field indeed, and it is not possible for the reviewer to discuss many of them.

The opening chapter deals with the recent Congress of the Pan-American Medical Association and the author describes the modern trend of medicine and surgery as seen at this Congress.

Many interesting articles follow and they are all written by specialists. Duodenal diverticulosis, the coronary problem in heart disease, mental hygiene, endocrinology and the therapeutic use and abuse of oxygen inhalations are but some of them. A very interesting paper on the origin of man is included, and the volume closes with some medical questionnaires on simple medical problems.

This book will be of value to those who are interested in the progress and advance of medical and surgical thought and practice in America.

It is well illustrated and there is a complete index.

H. H.

HANDBOOK OF BACTERIOLOGY.—By Joseph W. Bigger, M.D., Sc.D. (Dublin), F.R.C.P.I., D.P.H., M.R.I.A. Third Edition. London: Baillière, Tindall and Cox, 1932. Pp. xvi plus 459, with 5 plates and 84 text figures. Price, 12s. 6d. net.

THE issue of a third edition of this handbook of bacteriology within the space of a little more than seven years is a clear indication that the work has established its reputation and has supplied a want. The first two editions have already been reviewed in the *Indian Medical Gazette* of 1925 and 1929. The book remains essentially the same except that recent advances in the study of bacteria and new illustrations have been incorporated and the whole work thoroughly revised and brought up to date. The chapter on immunity has been largely re-written and Ehrlich's side-chain theory has almost disappeared. The subject-matter is dealt with from the point of view of the student and the wise course is followed of giving a single method for each operation, thus avoiding that bewildering choice which is so confusing to the average student. This has necessitated a certain amount of dogmatism in the presentation of the subject-matter, but as the author states it is better to be dogmatic, putting forward a probable theory as the correct one, rather than to leave the student confused with the claims of half a dozen rival theories, concerning the relative merits of which only the advanced worker is in a position to decide.

This book will serve as an extremely useful textbook of bacteriology for students of medicine.

C. L. P.

Annual Reports

THE PASTEUR INSTITUTE OF SOUTHERN INDIA, COONOR. ANNUAL REPORT OF THE DIRECTOR FOR THE YEAR 1930. BY MAJOR K. R. K. IYENGAR, M.D., D.P.H., I.M.S. MADRAS: METHODIST PUBLISHING HOUSE, 1931.

This report is in itself so brief that we may abstract from it in place of reviewing it.

This report covers the whole of the calendar year 1930. The number of patients treated at the Institute during the year was 541, a decrease of 66 on the number treated during the previous year. This decrease is easily accounted for. There was a striking fall in admissions from the Nilgiris District during the year, as the outbreak of rabies amongst jackals in Ootacamund and suburbs referred to in last year's report had practically died out by the commencement of the year. Five deaths occurred among those treated at the Institute during the year under report—a mortality rate of 0.92 per cent. At the close of the year 28 patients remained under treatment.

Advice, but no treatment, was given to 170 persons. The virus was in its 1154th passage on 31st December, 1930.

Semple's carbolised sheep vaccine was in use throughout the year. The vaccine is allowed to mature for a fortnight in the refrigerator before it is used, and considered efficient only up to three months from the

date of preparation. The dosage of the 1 per cent. vaccine is the same for all patients (5 c.cm. of 1 per cent. emulsion of fixed virus in carbolised saline daily for 14 days), but in the case of the 5 per cent. vaccine, 2½ c.cm. daily for 14 days has been used for patients under 14 years of age and 5 c.cm. daily for those over 14 years.

Antirabic vaccine for treating 7,178 persons was issued to the centres during the year. Of these, 6,039 are reported to have received a complete course of treatment. There were 36 deaths among them—a mortality rate of 0.59 per cent.

All cases of Class III and Class IV attending the Institute were treated with 5 per cent. vaccine from the middle of March 1930. Out of the 541 treated during the year, 262 were Class III and Class IV cases. Of these, 87 were treated with 1 per cent. vaccine until the introduction of the 5 per cent. vaccine and the remaining 175 with 5 per cent. vaccine. Out of the 175 treated with 5 per cent. vaccine, three died from hydrophobia: 1.71 per cent. mortality.

Out of 6,039 patients who received treatment at the centres, 3,575 are returned as Class III and Class IV cases. These were treated with 1 per cent. vaccine and among them 33 deaths occurred from hydrophobia: 0.92 per cent. mortality.

As the crude data stand the mortality rate was heavier on treatment with 5 per cent. vaccine than in cases treated with 1 per cent. vaccine, but this heavier mortality observed was not so excessive as to be considered 'significant' from a statistical point of view.

The total number of cases treated at the Institute from 1907 to 1930 was 33,736 and the number of deaths from hydrophobia among them was 377—a mortality rate of 1.11 per cent. The number of cases treated at the centres from 1922 to 1930 was 37,908 and the number of deaths from hydrophobia among them was 310—a mortality rate of 0.81 per cent. as shown in Table I.

The policy of decentralization of treatment adopted by the Institute in 1922 is fully justified by more people resorting to treatment owing to the fact that it is available nearer their homes instead of their having to come all the way to Coonor.

It will be seen from Tables III and III-A that the percentage of mortality is very much higher in the case of face bites and bites on bare skin than in the case of bites on other parts of body and through clothing.

Tables VI, VII, VIII and IX with their subdivisions prove that the depth of lesion, number of wounds, lateness in seeking the treatment and the position of bite have all a direct bearing on the increase or decrease of the mortality rate amongst the patients.

Deaths from hydrophobia that occurred amongst the treated population are shown in Tables X-A, X-B, and X-C. The total is 41 for the whole year both for the Institute and the centres. The shortest incubation period observed during the year is 19 days, the result of a bite by a fox. The longest incubation period noted is reported from Cocanada, where a patient bitten by a dog developed hydrophobia 300 days after bites on the leg.

Table XI shows that dogs account for over 96 per cent. of the bites treated at the Institute and centres.

With a view to standardize methods of collecting and tabulating the statistics of all Pasteur Institutes in India and Burma, the Rabies Sub-Committee, which met at Calcutta in December 1929, had recommended that history cards of uniform type ought to be used by all Institutes for recording statistical data. Accordingly, cards were brought into use both at the Institute and at the centres.

The introduction of the history cards and the adoption of other recommendations laid down by the Rabies Sub-Committee entailed the necessity of issuing elaborate instructions in a pamphlet form to medical officers in charge of treatment centres regarding the filling up of these case cards, classification of biting animal and wounds, maintenance of the required registers, etc., etc. The sanction of the Government was obtained to train 50 medical officers at the Institute, in

batches of 10 at a time, with the object of posting them to the various treatment centres. No efforts were spared to acquaint them with the work and to impress upon them the great importance attached to the subject of rabies and statistics relating thereto.

Ninety-four per cent. of the persons who had a full course of treatment at the centres and 88 per cent. of the persons treated at the Institute were followed up six months after completion of treatment and it was ascertained whether they were alive or had died from hydrophobia or from other causes.

The Health Committee of the League of Nations have laid down that the health reports of at least 80 per cent. of cases treated should be obtained if the statistics are to be of any value. It is hoped, therefore, that in future medical officers will bear in mind this fact and endeavour to send in health returns of every case treated by them.

The statistical tables have, with a few exceptions, been radically altered this year in order to conform to the standard prescribed by the Rabies Sub-Committee.

The total quantity of vaccine issued to the centres during the year was 502,765 c.c. (100,553 doses).

No complications of any sort, or any paralytic accidents have followed the treatment.

The following new centres were opened during the year:—

British Military Hospital, Malappuram.

Indian Military Hospital, Cannanore.

Indian Military Hospital, Trichinopoly.

The Government Hospital at Tuticorin was made an antirabic treatment centre.

ANNUAL REPORT OF THE CENTRAL CO-OPERATIVE ANTI-MALARIA SOCIETY, LTD., OF 1932. CALCUTTA.

MALARIA in the plains area of rural Bengal presents probably one of the most difficult problems of malariology in India. It has been investigated by many observers, the best known reports being those of Colonel Fry and Dr. Bentley. Bentley's ideas as to the causation and remedy are now well known, and have received support from many quarters, even though, as in the case of the League of Nations Malaria Commission, this support may be only qualified. Bentley's view is that the conditions now obtaining in Western and Central Bengal are the result of the drying up of the land by the withdrawal of the silty flood water of the Ganges and that the remedy lies in the reproduction of deltaic conditions there which existed say a century ago. Bentley's views have been accepted in general by practically every one who has studied the subject, but the application of remedial measures on his lines has hung fire, partly on account of the difficulty and magnitude of the forces and measures involved, partly on account of the cost, and partly owing to the fact that there existed no definite organisation either to put such operations into action or to carry them out. Rai Bahadur G. C. Chatterjee has attempted to tackle the problem by forming anti-malarial societies in the villages of Bengal on a co-operative basis. He is an enthusiastic supporter of the idea of getting silt-laden water back to the moribund and stagnant streams of Western and Central Bengal. His Central Society was founded in 1919 to co-ordinate and assist the work of the village societies. The annual meetings are interesting functions and have been presided over by distinguished local scientists and visitors. The present report gives the report of the annual meeting held in April 1932, at which Sir C. V. Raman presided. It gives a history of the movement and an account of the activities of the various societies. The Secretary's Report gives an interesting statement of conditions in the malarious districts of Central Bengal and reiterates the belief that salvation lies in cleaning out defunct river beds and letting in flood water either from the Damodar or the Ganges. Instances are given where this has been successfully done by co-operative

efforts of the local societies, in combination with the Irrigation Department. The Society also attacks kala-azar and since its inception has done a tremendous amount in this direction. The Co-operative Anti-malarial Society deserves every support and those interested should get the report to read.

ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1929. VOL. I. (WITH APPENDICES). CALCUTTA: GOVERNMENT OF INDIA. CENTRAL PUBLICATION BRANCH, 1932. PRICE, RS. 3-10-0.

THE Ministry of Health of England issues two reports annually dealing with the state of the public health of the country during the previous year. One of these presents statistical matter only; the other gives a critical account of the main happenings and discusses particular problems in a detailed manner. This system has several advantages, the chief being that the reader is enabled to grasp the main issues without his view being hampered by masses of statistical matter and tables which, however valuable for reference, are difficult to take in one's stride, and are distractions from the main themes. Major-General Graham makes the same remarks, but there are difficulties and some disadvantages in suddenly changing the form and presentation of annual reports, whose value depends to some considerable extent on their continuity of form and presentation. We hope however that it may be possible some day to adopt the Ministry of Health's system. This would ensure a much larger circle of readers for the extraordinarily interesting material and observations contained in the report. There is so much indeed in the report that it is difficult to summarise.

The following are some of the main facts in the vital statistics of India as a whole. The population during the decade 1921-31 increased by 10.2 per cent., compared with 1.2 per cent. in the decade 1911-21 and 7.1 per cent. in 1901-11; General Graham does not allow himself to speculate on the latest census figures beyond saying 'The ultimate effect on the country of such an increase as the last if it should continue opens up avenues of speculation'.

The birth rate of British India for 1929 was 35.37, the death rate 25.95, and the infantile mortality 178.39. A useful table of comparisons of birth and death rates of other countries is given. It is interesting to note that the natural increase of India (9.6 per 100 in 1927), is below that of Egypt, Palestine, South Africa, Australia and New Zealand; while it is three times as high as that of England and greater than that of the United States of America.

With regard to particular provinces the Central Provinces and Berar easily head the list of birth rates with 45.24, Bengal being the lowest with 28.7; the Central Provinces has also the highest death rate 35.77 and Burma the lowest. Some very illustrative and useful histograms showing these data have been prepared.

With regard to the chief diseases, 'fevers' easily heads the list in every province—it is of course a heterogeneous collection including malaria, kala-azar, enteric and many others. Fifty-eight per cent. of the mortality in 1929 was ascribed to 'fevers', respiratory diseases accounting for 6 per cent., cholera 5 per cent., smallpox and plague 1 per cent. each.

An attempt is made to evaluate the parts played by the various fevers. Several provinces return figures for malaria, enteric fever, kala-azar and relapsing fever. In the United Provinces for instance a mortality of 16.39 per 1,000 is ascribed to malaria in rural districts, in Bengal 7.6 per 1,000.

In the Indian Army malaria has only a total mortality of 0.15 per 1,000 and in jails 0.71, as compared with a mortality of 2.5 in the general population (estimating that one-sixth of the total 'fever' deaths are due to malaria). A description is given of the anti-malarial work carried out in various provinces. In the Punjab,

an unfavourable forecast led to special measures being taken, quinine depôts being established all over the affected areas. In Bengal the incrimination of *A. philippinensis* as the chief carrier in certain rural areas seems to have been established.

Kala-azar appears at present to be in the trough of its epidemic wave, though in Bengal 10,820 deaths were returned and 40,288 cases were treated. In Assam 1,405 deaths were reported and 23,804 cases were treated.

Enteric fever is much more prevalent than statistics indicate. Respiratory diseases since they began to be recorded as a separate cause of death since 1905, have shown an upward trend in the number of deaths returned. This is probably due to better registration. Delhi Province shows a very high death rate for respiratory diseases, due largely to the bad housing conditions in Delhi city. In Bombay and the Punjab, and the Central Provinces respiratory diseases are an important factor in mortality.

Figures for phthisis are recorded from various provinces; 126,895 deaths in India were reported from phthisis in 1929. The recorded death rates from phthisis vary in different provinces. The United Provinces return the highest figure of 2.01 for towns, Bombay coming next with 1.72 and Burma with 1.64 per 1,000. Farrukhabad of the United Provinces seems to head the list in 1929 with a phthisis death rate of 4.50, though many towns in the United Provinces, Bombay Presidency and Burma have also very high rates.

Cholera.—Very interesting histograms of cholera in India for 1877 to 1929 are given in a special plate, as also a map showing the distribution of cholera in 1929 throughout India, Central Bengal, Bihar, the United Provinces and Cuttack suffered most, though it was on the whole a year of moderate intensity.

Plague.—Plague seems to be dying out though very gradually; 1929 showed a further decrease. One map shows the distribution of mortality for 1929 and another very interesting one shows the results of 34 years of plague mortality in India. Very interesting and useful too are the coloured diagrams showing the mean relative humidity and the seasonal prevalence of plague in the various provinces.

The chapters on plague and the accompanying diagrams constitute a very interesting record—the tables of mean relative humidity given in the appendix should be of great value to workers who wish to go into the relationship of humidity and plague (or other diseases) more closely. Antirats campaigns still seem to offer the best means of antiplague work in India.

Smallpox.—Interesting and informative diagrams are given of the incidence of smallpox in India since 1877 up to 1929. Interesting notes are given on venereal disease, leprosy, beriberi and hookworm.

A special chapter is devoted to maternity and child welfare and the organisations (mainly voluntary) at work are described. In the midst of economic and political depression, this work is apt to be put in the background if not actually discouraged. Much is being done however, though progress may be slow. The United Provinces are the most active and progressive in this direction and many towns and districts are doing good work. It is needed, for the infantile mortality returns of the towns are very high.

* * * * *

Major-General Graham has been responsible for stressing the international aspects of public health in India. He has during the last eight or nine years represented the Government of India at the 'Office' in Paris of the International Sanitary Convention at the Health Section of the League of Nations, and at the Eastern Bureau of Epidemiology at Singapore. The notable work done in India in investigation and control of tropical diseases is now thoroughly understood by the countries of the world, and her difficulties appreciated.

The report gives some interesting details of the subjects discussed at the 'Office' and at the League of Nations Committees. Yellow fever is a disease upon

which careful guard must be kept and the importation of the virus into India for any purpose has been wisely forbidden.

To readers of the report outside India, probably the most interesting chapter will be that on 'Laboratories and Medical Research'. In this an excellent summary is given of the general and research work carried out in India in 1929 both by independent laboratories and under the auspices of the Indian Research Fund Association. The list is an impressive one, and indicates the importance of the quality and quantity of research work that is carried on every year in India. As the work was done in 1929, our readers who are interested will already have read the work on malaria, plague, bacteriophage, rabies, etc., that has been published.

Interesting chapters deal with the medical institutions and voluntary associations of India, and a section on jails is illuminating in its account of the care taken by the administrative jail officers (largely belonging to the Indian Medical Service) in the health and welfare of the jail population of India.

In his summary and conclusions General Graham pleads for an earnest consideration of the Central Health Organisation that should come into existence in any scheme of federation. We have before, in these columns emphasised the importance of this aspect of political development and trust that this last chapter at any rate will be read and noted by our responsible politicians. General Graham is to be congratulated on a clear and interesting exposition of the state of public health in India in 1929.

SEVENTH ANNUAL REPORT OF THE PASTEUR INSTITUTE, CALCUTTA, FOR THE YEAR 1930. CALCUTTA: BENGAL SECRETARIAT BOOK DEPOT. 1932. PRICE, 8 ANNAS.

For the first time in its history the number of patients attending the Pasteur Institute, Calcutta, showed a slight falling off in 1930, owing to the opening of a new Pasteur Institute at Patna in 1929 and of a new treatment centre at Cuttack by the Bihar and Orissa Government. During the year 6,958 patients completed treatment and 1,425 others received advice; the total attendance was 9,094 as against 10,219 in 1929. Since the opening of the institute in 1924 a total of 52,093 patients have been treated or have been advised.

Considerable difficulties were experienced in following up the after-histories of patients. The total health returns received were 76.3 per cent. for all cases, and 81.1 per cent. for classes III and IV. The mortality in the different groups of cases is well shown in the following figures:—

Class	Number treated	Hydrophobia rate per cent.
I. Licked only	224	0
II. Superficial bites (except on face and fingers)	578	0.17
III. Deep bites on trunk and extremities, and superficial bites on fingers	5,488	0.38
IV. Extensive deep bites and all bites on face and head	668	2.99

There were 42 deaths from hydrophobia during the year giving a total hydrophobia rate of 0.61 per cent. and a failure rate of 0.34 per cent. A new table introduced this year gives the sex and age distribution of the patients treated; this shows that the largest number of patients for any group is adult males between 20 and 29 years of age, followed by children between the ages of 5 and 9. The hydrophobia rates for children are rather high—0.91 per cent. for the age period 0—4 years, 0.81 per cent. at ages 5—9, and 0.48 per cent. at ages 10—14.

Of the patients treated 6,067 came from Bengal—where Calcutta, Dacca and Mymensingh head the list—481 from the United Provinces, and 380 from Bihar and

Orissa. Among the biting animals responsible there are to be noted the inclusion of 6 mongoose, one buffalo and an inoculated rabbit. The hydrophobia rate was 0.34 per cent. for dog bites as against one of 1.9 per cent. for jackal bites. No less than 30 out of 95 specimens received for examination for rabies were in a decomposed state and unfit for examination, and it is clear that the medical profession in India have still much to learn in this connection.

The Pasteur Institute, Calcutta, still continues to function in extremely congested and unsuitable quarters, but it seems unlikely that funds will be available in the near future for securing proper accommodation. 'The effect of non-decentralization is being very keenly felt', writes the Superintendent. 'With the numbers of patients attending and the limited accommodation available it makes it extremely difficult for the work to be carried on'.

Major E. C. R. Fox, I.M.D. was in charge of the Institute throughout the year.

THE SOUTH AFRICAN INSTITUTE FOR MEDICAL RESEARCH. ANNUAL REPORT FOR 1930.

THIS annual report, by Sir Spencer Lister, the Director, is always of interest, since many of the problems with which it deals are also of Indian interest. The two chief events of the year were the completion of the extensions to the main institute at Johannesburg, commenced in 1928, and the opening of a new branch laboratory at Port Elizabeth. The first International Silicosis Conference was held in Johannesburg in August 1930 and was attended by delegates from many parts of the world. The problems concerned are ones especially affecting the Rand, and several officers of the Institute contributed papers.

In the Department of Bacteriology Dr. Harvey Pirie reports on a study of pneumonia among the native population on the mines of the Witwatersrand. Bacteriological evidence supports the clinical view that of recent years this disease has changed in its aspects and ætiology; it is no longer a frank lobar consolidation due to the pneumococcus, but more often begins as an influenza. The introduction of a prophylactic vaccine in 1923 rapidly reduced the mortality rate down to a figure of 2.16 per 1,000 in 1925, but since 1926 the mortality has again been rising, and in 1929 it was 3.36 per 1,000. Pneumococcus groups A, B and C (Lister) disappeared, but were replaced by new strains of pneumococci. From 1927 onwards pneumococci became of less importance and secondary organisms of more importance. A 'community autogenous vaccine' was prepared and is now in use. There are two peaks of pneumonia incidence during the year; one in winter especially associated with the streptococcus-influenza group of organisms, and one in summer more frequently associated with the pneumococcus as the sole infecting agent. Malaria was not detected as a predisposing cause of these cases of pneumonia, and mice exposed to infection in the pneumonia wards did not contract the disease. A bacteriological study was made of seven fatal cases of measles associated with grave respiratory complications; in all seven a hæmolytic streptococcus was isolated from the lung tissue.

One hundred and seventy-four deaths occurred from meningitis. The pneumococcus was isolated from the cerebro-spinal fluid of 53 of these cases, and a large number of them corresponded serologically with the 'C/M' type locally prevalent as the cause of pneumonia on the mines; 64 were due to the meningococcus. During the year type IV meningococci were isolated from cases, in addition to the usual types I, II, and III previously found. A trial was made of 'penicillin'—a filtered extract of a broth culture of a species of penicillium fungus, which inhibits the growth of the usual Gram-positive organisms in sputa. The addition of this extract to blood-agar plates renders easier the isolation of the bacillus of Pfeiffer and of the *B. pestis*.

In the Department of Industrial Hygiene much work has been carried out in connection with the Tuberculosis Research Committee's programme by Dr. Mavrogordato. Ventilation on the mines is a special problem in this department, and attempts are being made to reduce the relative humidity of the air delivered in the underground workings without increasing the proportion of air-borne dust. This dust consists of two portions, the total air-borne dust containing only a proportion of phthisis-producing 'intractable' dust. Methods for estimating the latter alone are on trial.

In the Department of Parasitology Dr. Annie Porter has been studying the schistosome infections of South Africa, and read a paper on animal parasites affecting man in South Africa at the Congress of the Medical Association of South Africa held at Durban in July. In the Department of Biochemistry Dr. F. W. Fox has continued his studies on caries of the teeth in children living in local institutions and day schools; in the Government schools an incidence up to 90 per cent. was discovered. The value of the diazo reaction in early diagnosis was studied in connection with a local outbreak of typhoid fever, and a beginning has been made of a study of the vitamine A content of local native dietaries. In the Department of Entomology Mr. de Meillon toured the malarious regions of the Transvaal and Natal with Sir Malcolm Watson, and was attached to the mission under Professor Swellengrebel to investigate and report upon the malaria problem in certain areas of the Union. Large numbers of mosquito larvæ and adults were received for identification, also fleas and other insects of medical importance. It was found that pools covered with the plants *Lemna minor* and *Wolffia arrhiza* were unsuitable for breeding of *Anopheles gambiae*. A case occurred in which a full grown larva of *Æstrus ovis*, the nasal bot-fly of sheep, was passed in human faeces; the larva was probably deposited by the adult fly at the entrance to the nares and had passed into the intestines. In the Research Division Dr. M. J. A. des Ligneris (Arnold Friedlander Research Fellow) continued his investigations on cancer, and here a considerable volume of research work is reported on. In connection with Rous' sarcoma of fowls, whereas it is well known that this tumour infection can be transmitted indefinitely from fowl to fowl, it was found that on passage into turkeys or guinea-fowl the virus died out after a few passages; by passaging alternately however into a guinea-fowl (or turkey), then into a fowl, then again into a guinea-fowl (or turkey) the virus maintains its full virulence. The natural melanomata of old female Angora goats fails on direct transplantation into healthy Angora goats, but if the graft be embedded in a plasma-serum nutrient medium from the donor, it takes and a small melanoma results, only however to finally regress and disappear.

The second half of the report deals with the Routine Division, in which the total number of specimens examined during the year was 93,157. Examination of sputa from suspected cases of pulmonary tuberculosis at the mines was so laborious a part of these duties, that this work has now largely been de-centralized and local arrangements made for direct examinations at the mines' hospitals. Bacillary dysentery is prevalent, and is chiefly of Flexner and Sonne types. Five hundred specimens of the blood of lepers from the Leper Institute, Pretoria, were examined by the Wassermann test; 27.4 per cent. were strongly positive, and 2.6 per cent. positive. Undulant fever was serologically proved in four cases, and blood culture from a fifth yielded a growth of *Br. melitensis*. Autopsies during the year numbered 371, and a number of interesting findings are noted: in one instance a patient with no previous history of malaria died a few days after an operation for radical cure of hernia; at autopsy the blood and organs were found swarming with *P. falciparum*. A case of acute intestinal obstruction was found to be due to impaction of ten round-worms in the ileo-cæcal valve. One case of actinomycosis came to autopsy; the lesions

involved the caecum, the liver, the lumbar vertebrae and the psoas muscle—a psoas abscess resulting.

The Serum Department carried out a very large volume of work during the year, 92 horses being used. Over 2,000 litres of various therapeutic sera were sent out, in addition to high-titre diagnostic sera of many types. A concentrated anti-typhoid serum is now on trial therapeutically. B. C. G. anti-tuberculosis vaccination is on trial on a very large scale, some 1,500 individuals having been so vaccinated during the past three years. Results are being collected.

Correspondence

PUBLIC HEALTH INTELLIGENCE OF THE HEALTH ORGANISATION OF THE LEAGUE OF NATIONS.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—May I through the courtesy of your columns bring to the notice of the Public Health Administrators the facilities that exist in the Health Organisation of the League of Nations for the supply of information relating to the detailed application of different Public Health methods in various countries. In addition comparative information is available with regard to Epidemiological Statistics and Public Health Legislation.

The Health Organisation is willing to supply, as far as possible, data on the above branches of Preventive Medicine.

Enquiries are however limited to those from the heads of large administrations or the heads of Scientific Institutions who should indicate the purpose for which the information is required in view of the amount of work that unconsidered requests necessarily involve. Furthermore enquiries should be limited to information that is not already in the medical press.

All enquiries should be addressed to the Medical Director, Health Section, marked 'Public Health Intelligence', League of Nations, Geneva, Switzerland.—Yours, etc.,

L. RAJCHMAN,
Medical Director.

LEAGUE OF NATIONS,
HEALTH SECTION,
GENEVA,
31st May, 1932.

Service Notes

APPOINTMENTS AND TRANSFERS

LIEUTENANT-COLONEL C. A. GILL, Director of Public Health, Punjab, is appointed to officiate as Inspector-General of Civil Hospitals, Burma, with effect from the afternoon of the 20th July, 1932, *vice* Colonel P. L. O'Neill, C.I.E., proceeded on leave.

The services of Major G. R. McRobert are placed permanently at the disposal of the Government of Burma, with effect from the 10th November, 1932.

Major W. P. Hogg, D.S.O., M.C., an Agency Surgeon, is posted as Agency Surgeon, Gilgit, with effect from the afternoon of the 19th October, 1931.

Major J. C. De is appointed as Professor of Clinical Medicine, Medical College, and Physician to the Medical College Hospitals, Calcutta, for a period of two years, with effect from the 20th June, 1932.

Major L. A. P. Anderson, an officer of the Medical Research Department is confirmed in his appointment as Director, Pasteur Institute, Rangoon, with effect from the 19th February, 1932.

Subject to His Majesty's approval, the undermentioned officers whose appointments on probation were notified in the Army Department Notification No. 90,

dated 20th February, 1932, are confirmed in the following order:—

Captains

G. D. Malhoutra.
B. P. Baliga.
R. K. Tandon.

The undermentioned officers are confirmed in the rank of Captain:—

Captain (Prov.) J. H. Boulthec.
Captain (Prov.) P. L. O'Neill.
Captain (Prov.) H. S. Smithwick.
Captain (Prov.) H. J. Curran.

PROMOTIONS

Colonel to be Major-General

T. G. F. Paterson, D.S.O., K.H.P. Dated 7th July, 1932.

Majors to be Lieutenant-Colonels

R. Sweet, D.S.O. Dated 25th July, 1932.
J. R. D. Webb, O.B.E. Dated 25th July, 1932.
F. Phelan. Dated 25th July, 1932.
A. C. Macrae. Dated 25th July, 1932.
N. C. Kapur. Dated 25th July, 1932.

Captains to be Majors

B. P. Baliga. Dated 17th December, 1930.
R. K. Tandon. Dated 15th March, 1931.
G. D. Malhoutra. Dated 16th April, 1931.
A. H. Craig. Dated 23rd June, 1932.
Lieutenant (on prob.) G. R. M. Apsey to be Captain (Prov.) (on prob.), 22nd May, 1932.

Lieutenant to be Captain

E. A. Y. Mackeown. Dated 4th February, 1932.
Lieutenants (on prob.) to be Captain (on prob.)
V. Srinivasan. Dated 25th August, 1931.
H. D. R. Zscherpel. Dated 15th July, 1932.

RETIREMENTS

Colonel H. M. Mackenzie, C.I.E., V.H.S. Dated 14th May, 1932.

Lieutenant-Colonel W. D. Ritchie. Dated 4th April, 1932.

Lieutenant-Colonel A. K. Laudie. Dated 18th June, 1932.

Lieutenant-Colonel H. Ross, C.I.E., O.B.E. Dated 3rd June, 1932.

Notes

'HALIVEROL', PARKE DAVIS & CO.

This is a new preparation containing vitamins A and D. The following are notes by Messrs. Parke Davis and Co. concerning it.

'This product is based on extensive vitamin research work and is a discovery that we believe will be of far-reaching therapeutic significance. This discovery, in short, is that the oil obtainable from halibut livers by special methods of extraction far exceeds cod-liver oil in potency with regard to both vitamin A and vitamin D.

'The new product designated Parke-Davis "Haliverol" is a combination of halibut liver oil with irradiated ergosterol in such proportions as to make its vitamin A value 60 times that of a high-grade cod-liver oil, and its vitamin D antirachitic value (adjusted by the addition of irradiated ergosterol) equal to a potency of 250 D. This product supplies a rich natural source of the anti-infective and growth-promoting vitamin A, and the antirachitic vitamin D in the concentration approved by authoritative scientific workers.

'*Malnutrition and lowered resistance to infection.*—During the first two years of life, at least, all infants should be abundantly supplied with vitamins A and D to insure, as far as possible, normal growth and in particular normal development of the gums and teeth as well as to fortify them against infection. Animal experiments have shown that vitamin A bears a direct

relation to infections of the respiratory tract, starting in the nares, with the possible subsequent involvement of the sinuses, tonsils, middle ear, and bronchi.

'Rickets.'—One of the most important indications for Parke-Davis "Haliverol" is rickets. In uncomplicated cases Irradol alone undoubtedly meets the indication, but if there is any question of a vitamine A deficiency in the diet, as indicated by retardation in growth or tendency toward respiratory infection "Haliverol" gives the patient the full quota of vitamine D contained in Irradol, part of it from the oil itself, and in addition 60 times as much vitamine A as would be contained in the same dose of high-grade cod-liver oil.

'Periods of special stress, such as pregnancy and lactation, present a demand which may be very urgent at times for one or perhaps both of the vitamins contained in Parke-Davis "Haliverol". During pregnancy, for example, there is a special strain on the reserves of vitamine A stored in the liver, and unless the expectant mother fortifies herself during this period of stress, her resistance will be lowered and in time she will not be able to furnish an adequate supply of this important nutrient factor to the foetus and later to the infant when the period of lactation is reached. Adults whose resistance to respiratory infection is low need the protection that "Haliverol" affords as much as children do. And in adults, too, the nutritive and stimulating properties of "Haliverol" should not be overlooked, especially in patients who are habitually under weight.

'The dose of Parke-Davis "Haliverol" is practically the same as that of Irradol. Three drops (1 minim) is equivalent to 1 teaspoonful of high-grade cod-liver oil.

Infants—Prophylactic daily dose for the average infant is 8 to 10 drops; for premature and rapidly growing infants, 10 to 15 drops; curative daily dose for average infant, 15 to 20 drops; for severe rickets, 20 to 30 drops.

Children—Prophylactic daily dose, 15 to 20 drops; curative daily dose, 20 to 30 drops.

Adults—Ten to 15 drops three times daily as indicated.

'Parke-Davis "Haliverol" is supplied in 5 c.cm. amber bottles and 50 c.cm. with a dropper to facilitate the removal and measurement of the desired dose. Literature will be sent to physicians on request from Parke Davis & Company, P. O. Box 88, Bombay'.

AN EMERGENCY OUTFIT FOR BURNS

THE tannic acid treatment of burns is what one may term a recent triumph of minor surgery. Introduced by Davidson in 1925, the results were so promising that the matter was investigated by the Medical Research Council of Great Britain. Wilson in 1928 described results in Edinburgh—117 cases with 13 deaths, or a mortality of 11 per cent. as against a previous mortality of 40 per cent. The results were even better in children than in adults.

The actual method employed and recommended by him was the application of a 2.5 per cent. solution of tannic acid in warm sterile water sprayed on the affected parts, and dried by means of electric lamps in a bed cage. This process is repeatedly hourly until the whole area is covered with a thick brown coagulum. Special care must be taken not to spray the cornea and under no circumstances should wet dressings be applied to the coagulum. An important feature of the method is the instantaneous alleviation of pain after the first application, but a very great drawback to the treatment is that the tannic acid solution has to be freshly prepared.

Under these circumstances, the Crookes Laboratories have devised an emergency apparatus which may well prove of great value in factories, etc., where cases of burns are numerous. The outfit consists of a spray adaptor designed to fit the 'Collosal' tannic acid ampoules. The latter are put up in sealed ampoules, six in a box, each of 30 c.cm. (1 oz.) capacity, and it is claimed that this 'Collosal' solution is perfectly stable.

To use the apparatus an ampoule is warmed in hot water. It is then scored at the neck, broken off at the constriction, and the spray adaptor fitted to the ampoule, this giving an air-tight seal. The apparatus is then ready to use as a spray on the burnt surface.

The spray adaptor is priced at Rs. 8-11-0, and a box of six ampoules at Rs. 4-14-0. The Indian branch are the Crookes Laboratories, 10, Graham Road, Ballard Estate, Bombay. The whole outfit appears to be ideal for emergency use, and may interest factory managers as well as medical men.

'MULTIBRAL'

'MULTIBRAL', manufactured by Messrs. H. R. Napp, Ltd., 3 and 4, Clements' Inn, Kingsway, London, W.C. 2, is stated to be sodium monobromoleate, a new chemical preparation built up on the special position of bromine in the molecule. It is put up in the form of coated pellets, each of which has a content of 0.03 grm. of bromine.

It is claimed that this product has a very much higher degree of pharmacological action than any bromide combinations, and that it is possible to obtain definite results with very small doses. Treatment over prolonged periods is not attended with secondary toxic effects. The preparation is indicated in all conditions in which bromides are customarily prescribed, in a dosage of 1 to 3 pellets thrice daily. It is put up in tins of 25 and 50 pellets, and in bottles of 100 pellets.

THE ROYAL INSTITUTE OF PUBLIC HEALTH

We have been asked to announce that the address of the Royal Institute of Public Health has been removed from 37, Russell Square to 23, Queen Square (and Guilford Street), London, W.C. 1, England.

Publishers' Notice

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles are entitled to receive 25 reprints *gratis*; additional reprints can be obtained on payment. No reprints will be supplied unless contributors ask for them at the time of submitting their manuscripts.

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The Editors of *The Indian Medical Gazette* cannot advise correspondents with regard to prescriptions, diagnosis, etc., nor can they recommend individual practitioners by name, as any such action would constitute a breach of professional etiquette.

Original Articles

A STUDY OF THE DISTRIBUTION OF SUGAR IN THE BLOOD OF DIABETIC AND NON-DIABETIC INDIAN SUBJECTS

By J. P. BOSE, M.B., F.C.S. (Lond.)

Officer in-charge, Diabetes Research Department, School of Tropical Medicine and Hygiene, Calcutta

Concise statement

In the routine determination of the sugar-content of the blood, whole-blood is usually used. It is shown in this paper that, although in normal healthy subjects, the difference in result between the whole-blood, the plasma and the corpuscular sugar vary within narrow limits, it is very much more marked in cases of diabetes mellitus. In moderately severe or severe cases of diabetes it is shown that the plasma sugar is much higher than the whole-blood sugar and is higher still than the corpuscular sugar, the difference between the plasma sugar and the corpuscular sugar in a moderately severe case of diabetes mellitus seldom falling below 20 per cent. In severe cases it may be much higher. The author is of opinion that in cases of diabetes mellitus the determination of plasma sugar and the corpuscular sugar as well as the determination of the *plasma-corpuscular sugar ratio** will give a much clearer idea of the nature and the severity of the disease than is offered by the determination of the whole-blood sugar alone. It is shown that the lack of permeability of the corpuscles to sugar intake and the lack of utilization of sugar within their own walls is responsible for the corpuscular sugar being so low in cases of diabetes as compared with the plasma sugar. It has also been definitely shown that insulin helps to increase the permeability and the utilization of sugar in the corpuscles.

Introduction

That normal blood contained sugar was known from the time of Claude Bernard, but the accepted view has been all along that the centre of content for the whole amount of sugar was the plasma. Michaelis and Rona (1909) were probably the first investigators to demonstrate by experiments on dogs that the blood corpuscles contained sugar, though there was no constant relationship between the

corpuscular sugar and the plasma sugar. The work of the above-named authors brought on a very interesting controversy and Bang (1912) challenged the correctness of the results obtained by them. However, the work of Michaelis and Rona received confirmation in a modified form at the hands of other workers, notably Falta and Quittner (1919 and 1921) and many others.

Without going into details, it may be stated that it is only recently that investigation has proved beyond doubt that the sugar-content in the blood is shared between the corpuscles and the plasma, although the exact relationship between the whole-blood sugar, plasma sugar and the corpuscular sugar has not been fully worked out.

Spannuth and Power (1931) went a step further when they found that in diabetes the distribution of sugar between the whole-blood, the plasma and the corpuscles is not different from that found in normal persons, and that the changes of distribution following the ingestion of glucose are the same in both diabetic and non-diabetic individuals. They also think that there is no evidence that the permeability of the corpuscles to glucose in the case of a diabetic is in any way different from that of a normal person.

John (1923), however, observed a fairly equal distribution of sugar between the corpuscles and the plasma in the blood of fasting normal persons, but in diabetic patients he found a higher sugar-content in the plasma than in the corpuscles. Michael Somogyi (1928), who had done much valuable work on this line, corroborated the results only as far as the apparent blood-sugar values were concerned but not as regards the true sugar. True sugar, according to this author, is the difference between apparent sugar (or the total reducing substance) and the reduction due to non-sugar reducing elements present in the blood.

In the present work, the sugar-content of the whole-blood, the plasma and the corpuscles has been studied on Indian subjects in the fasting state, both in diabetic and non-diabetic individuals. The effect of the oral administration of glucose on the sugar-content of the plasma and the corpuscles has also been studied in both these groups of cases. The effect of subcutaneous injection of insulin has also been studied from the same point of view.

It should be pointed out that no attempt has been made to adjust the variations in the blood-sugar results due to slight variations in the volumes of the plasma and the corpuscles by hæmatocrite or other determinations. All the tests were done under similar conditions. The author has relied on the work of Dreyer, Bozette and Pierce (1920) according to which it appears that the error due to the variation in volume is not so great as to affect the comparative results on which this paper is based.

* *Plasma-corpuscular sugar ratio*, or the percentage increase of the plasma sugar over the corpuscular sugar. The importance of determining this ratio as a guide to treatment is being worked out by the author and will form the subject of a separate communication in a future issue of this journal.

Method

The sugar-content of the whole-blood, the plasma and of the corpuscles were determined in the following manner. A sample of blood was taken by vein puncture, one portion was run into a paraffin-coated centrifuge tube and another portion into a tube containing potassium oxalate, both tubes being kept in ice.

Average fasting corpuscular sugar 92 mgs. per 100 c.c.

It will be seen from the table below that in normal healthy Indian subjects,

(1) the plasma sugar is almost always lower than the whole-blood sugar,

(2) that although the plasma sugar is slightly lower than the corpuscular sugar in most cases,

TABLE I

Distribution of sugar in the whole-blood, plasma, and corpuscles in normal healthy Indian subjects

Serial number	Reference	Nationality, sex and age	BLOOD-SUGAR (FASTING LEVEL). MILLIGRAMMES PER 100 C.C.		
			Whole-blood	Plasma	Corpuscles
1	S. C. M. ..	H. M., 25	110	108	100
2	J. D. ..	M. M., 34	85	83	81
3	J. C. ..	H. M., 30	92	94	92
4	P. C. ..	H. M., 33	104	100	102
5	A. B. C. ..	H. M., 35	98	101	93
6	A. B. ..	H. M., 30	97	92	90
7	M. F. ..	I. Ch. M., 40	96	82	90
8	P. B. ..	H. M., 35	96	87	84
9	Md. A. ..	M. M., 45	103	95	91
10	R. Khalif ..	M. M., 47	109	102	98
11	P. Mia ..	M. M., 37	112	102	99
12	M. S. (Mrs.) ..	H. F., 30	106	92	86
13	C. (Mrs.) ..	H. F., 40	98	94	85
14	A. Ghose ..	H. M., 50	96	94	91
15	N. C. ..	H. M., 45	109	101	97
16	L. B. ..	H. M., 36	103	102	100
17	M. D. ..	H. M., 45	112	109	101
18	K. M. ..	H. M., 56	97	92	85
19	A. A. ..	M. M., 35	92	90	89
20	Hiralal ..	H. M., 27	99	95	94
21	D. G. ..	H. M., 46	98	90	87
22	N. G. ..	H. M., 47	101	105	94
23	R. D. ..	H. M., 57	108	100	100
24	M. K. ..	H. M., 40	102	92	89
25	P. P. ..	H. M., 27	106	95	91
26	S. S. ..	H. M., 60	88	87	85
27	S. N. ..	H. M., 37	110	93	90
28	L. D. ..	H. M., 49	110	102	92
29	H. (Mrs.) ..	H. F., 30	105	106	103
30	S. M. ..	H. M., 50	97	85	83

The oxalated blood was used for the determination of whole-blood. The sample of blood in the paraffin-coated tube was centrifuged at once, for three to four minutes, at a revolution of 3,000 per minute, and the plasma was pipetted off and oxalated. The corpuscular deposit was oxalated and centrifuged for a further period of 10 minutes. The amount of oxalate used was very small and barely exceeded the concentration of 0.2 per cent., and hence there was very little possibility of the anticoagulant altering the ionic equilibrium to any extent.

Explanation (Table I)

Average fasting whole-blood sugar 101 mgs. per 100 c.c.

Average fasting plasma sugar 95 mgs. per 100 c.c.

the variation is only slight as compared with diabetic subjects (cf. Table II).

Explanation (Table II)

The following table shows in diabetic subjects,

(1) that the plasma sugar is almost always higher than the whole-blood sugar,

(2) that the plasma sugar is always much higher than the corpuscular sugar,

(3) that the increase of the plasma sugar over the corpuscular sugar appears to be greater according to the severity of the disease; in other words the graver the disease, the higher is the ratio of the plasma sugar over the corpuscular sugar (cf. cases 22, 25, 28 and 30).

TABLE II

The distribution of sugar in the whole-blood, plasma, and corpuscles in diabetic subjects

Serial number	Reference	Nationality, sex and age	BLOOD-SUGAR (FASTING LEVEL), MILLIGRAMMES PER 100 C.C.			* Plasma-corpuscular sugar ratio
			Whole-blood	Plasma	Corpuscles	Per cent.
1	M. M. ..	H. M., 46	143	147	125	15
2	N. C. ..	H. M., 30	195	204	174	15
3	K. C. ..	H. M., 30	107	110	96	13
4	A. C. B. ..	H. M., 26	176	187	155	18
5	S. B. ..	H. M., 45	134	141	120	15
6	A. A. ..	H. M., 47	159	163	140	15
7	A. B. ..	H. M., 50	129	132	119	18
8	F. (Mrs.) ..	M. F., 35	148	153	136	12
9	P. B. ..	H. M., 43	162	170	141	18
10	P. K. B. ..	H. M., 53	180	194	170	13
11	P. M. ..	M. M., 48	214	261	210	20
12	G. R. K. ..	M. M., 50	221	270	220	19
13	M. M. ..	M. M., 52	206	230	190	18
14	K. G. ..	H. M., 43	208	221	180	19
15	D. A. ..	H. M., 28	256	280	235	17
16	N. G. ..	H. M., 38	260	289	240	17
17	M. A. ..	M. M., 56	261	285	231	19
18	D. (Mrs.) ..	H. F., 57	250	279	230	18
19	N. M. B. ..	H. M., 42	214	239	192	20
20	J. N. M. ..	H. M., 57	209	225	180	20
21	S. M. ..	H. M., 47	330	390	300	24
22	D. R. ..	H. M., 52	405	445	310	31
23	P. (Mrs.) ..	H. F., 32	332	356	258	28
24	R. M. ..	H. M., 49	470	540	418	23
25	D. (Mrs.) ..	H. F., 32	440	450	300	34
26	R. S. ..	H. M., 45	310	323	234	28
27	R. B. ..	H. M., 56	306	320	235	27
28	P. C. R. ..	H. M., 43	309	339	210	39
29	A. G. ..	H. M., 46	336	350	270	23
30	M. M. ..	M. M., 43	392	454	300	34

TABLES III AND IV

The relationship between the 'plasma' sugar and the 'corpuscular' sugar after glucose ingestion

Table III (normal healthy individuals)

	CASE NUMBER ONE			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	85	106	84	75
Plasma sugar, mgs. per 100 c.cm.	80	106	72	65
Corpuscular sugar, mgs. per 100 c.cm.	75	100	75	70
* Plasma - corpuscular sugar ratio.	+ 7	+ 6	- 4	- 7

	CASE NUMBER TWO			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	100	140	120	90
Plasma sugar, mgs. per 100 c.cm.	95	141	116	88
Corpuscular sugar, mgs. per 100 c.cm.	87	117	100	88
* Plasma - corpuscular sugar ratio.	+ 9	+ 18	+ 14	0

* Plasma-corpuscular sugar ratio or percentage increase or decrease of plasma sugar in relation to corpuscular sugar.

Table III—concl'd

	CASE NUMBER THREE			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	108	147	86	85
Plasma sugar, mgs. per 100 c.cm.	95	142	86	78
Corpuscular sugar, mgs. per 100 c.cm.	85	116	80	78
* Plasma - corpuscular sugar ratio.	+ 11	+ 19	+ 4	0

	CASE NUMBER FOUR			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	100	125	100	92
Plasma sugar, mgs. per 100 c.cm.	90	112	90	80
Corpuscular sugar, mgs. per 100 c.cm.	82	99	80	80
* Plasma - corpuscular sugar ratio.	+ 9	+ 12	+ 11	0

	CASE NUMBER FIVE			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	86	110	84	78
Plasma sugar, mgs. per 100 c.cm.	80	104	78	72
Corpuscular sugar, mgs. per 100 c.cm.	76	100	75	71
* Plasma - corpuscular sugar ratio.	+ 5	+ 4	+ 4	+ 2

* Plasma-corpuscular sugar ratio or percentage increase or decrease of plasma sugar in relation to corpuscular sugar.

Table IV (diabetic subjects)

	CASE NUMBER ONE			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	135	191	220	198
Plasma sugar, mgs. per 100 c.cm.	140	201	230	204
Corpuscular sugar, mgs. per 100 c.cm.	115	150	170	153
* Plasma - corpuscular sugar ratio.	+ 18	+ 26	+ 35	+ 33

	CASE NUMBER TWO			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	350	456	526	554
Plasma sugar, mgs. per 100 c.cm.	390	515	594	630
Corpuscular sugar, mgs. per 100 c.cm.	300	350	390	410
* Plasma - corpuscular sugar ratio.	+ 24	+ 33	+ 35	+ 35

	CASE NUMBER THREE			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	234	333	416	334
Plasma sugar, mgs. per 100 c.cm.	264	384	460	375
Corpuscular sugar, mgs. per 100 c.cm.	212	286	326	275
* Plasma - corpuscular sugar ratio.	+ 20	+ 25	+ 29	+ 27

Table IV—concl'd

	CASE NUMBER FOUR			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	330	462	500	530
Plasma sugar, mgs. per 100 c.cm.	390	518	580	610
Corpuscular sugar, mgs. per 100 c.cm.	310	372	390	400
* Plasma - corpuscular sugar ratio.	+ 24	+ 29	+ 30	+ 35

	CASE NUMBER FIVE			
	Initial blood-sugar level	TIME IN HOURS AFTER GLUCOSE INGESTION (50 GRAMMES)		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	310	373	418	356
Plasma sugar, mgs. per 100 c.cm.	323	404	455	380
Corpuscular sugar, mgs. per 100 c.cm.	234	274	304	264
* Plasma - corpuscular sugar ratio.	+ 28	+ 33	+ 34	+ 31

* Plasma-corpuscular sugar ratio or percentage increase of the plasma sugar over corpuscular sugar.

Explanation (Tables III and IV)

A careful and comparative study of Tables III and IV brings out a few very important facts. Thus, we see that in a normal person:—

(1) During the period of rise of blood-sugar, after glucose ingestion, the greatest rise seems to be in the plasma sugar.

(2) The corpuscular sugar also rises to a great extent and the rise is quite comparable to that of the plasma sugar.

(3) During the period of fall of blood-sugar after glucose ingestion, the plasma and the corpuscular sugar tend to approximate to each other.

In cases of diabetes, on the other hand, things appear to be entirely different. Thus, it will be seen that in a case of diabetes of moderate grade of severity:—

(1) During the period of rise of blood-sugar, after glucose ingestion, the rate of rise of sugar

in the corpuscles is very much less than in the plasma. Thus in case No. 2 (Table IV) it will be seen, that whereas the rise of sugar in the plasma during the first hour after glucose ingestion is 32 per cent., the rise in the corpuscles is 16 per cent. only.

(2) During the period of fall of blood-sugar after glucose ingestion, the plasma sugar is still very much higher than the corpuscular sugar. Thus, it will be seen in the same case that the plasma sugar is 35 per cent. higher than the corpuscular sugar, even 3 hours after glucose ingestion.

It is clear from the above observations that the corpuscles in a normal healthy individual behave quite differently from those in diabetic subjects, in their capacity to take in and hold the sugar after glucose ingestion. The corpuscles in a normal individual have the capacity of taking in sugar almost as readily as the plasma during the period of rise of blood-sugar, after glucose ingestion. During the period of fall of blood-sugar after glucose ingestion (as a result, it will be remembered, of the intervention of the sugar storage mechanism, usually during the second hour) the corpuscles, like other tissues of the body, operate to remove the excess of sugar from the surrounding plasma and to utilize it within their own walls. The result is that very soon an equalization is reached between the plasma and the corpuscular sugar and they approximate to each other.

Things, however, are quite different in the case of diabetics, especially those of the moderately severe or the severe type, in whom the sugar utilization is markedly defective. In these cases, it is clearly seen that the corpuscles are unable to take in sugar as readily as the plasma, and thus the rise of sugar in the corpuscles during the period of rise of sugar, after glucose ingestion, is very much lower than in the plasma; during the period of fall of blood-sugar, after glucose ingestion (the time depending on the severity of individual cases), the corpuscles are found unable to abstract much of the extra sugar from the surrounding plasma and to utilize it within their own walls. The result is that the plasma sugar is still much higher than the corpuscular sugar, even 3 hours after the glucose meal, in a moderately severe case of diabetes mellitus. It seems reasonable to think that lack of insulin has something to do with the permeability of the corpuscles to the sugar intake, or the capacity of the cells to utilize or store up sugar within their own walls.

In this connection, it is interesting to compare the findings of John (1930), who, by a simple experiment, has shown that the capacity of the corpuscles to take in sugar is much greater in normal than in diabetic subjects.

John by suspending the corpuscles in 1 per cent. glucose in N/10 saline for two hours has

definitely shown that whereas the actual percentage increase in corpuscular sugar in non-diabetic individuals is 321 per cent., the same among the diabetics is only 185 per cent.

It has been argued that the corpuscles being constantly bathed in the surrounding plasma, an equilibrium should be reached by the process of osmosis through the corpuscular membranes. This is true to some extent, but it should also be remembered that the corpuscles are living tissues and that they have an inherent power of taking in and utilizing sugar, from the surrounding plasma, within their own walls like other tissues of the body. If the function of the corpuscular membranes only served the purpose of a mechanical osmosis, the sugar-content in them would have been constant under all conditions, but that this is not so can be seen readily in the light of the above experiments.

Effect of insulin on the relationship between the plasma and the corpuscular sugar in diabetic subjects

It has already been shown that in diabetes there is a wide difference between the proportion of plasma sugar and the corpuscular sugar; this difference seems to increase as the severity of the disease increases. It has also been argued that the low proportion of corpuscular sugar in diabetes is due to the inability of the corpuscles to take in and utilize sugar from the surrounding plasma, and hence as the plasma sugar goes up the corpuscular sugar is unable to keep pace with it.

The following table shows the effect of insulin on the relationship between the plasma and the corpuscular sugar in five typical cases of diabetes mellitus.

TABLE V

Showing the effect of an insulin injection (dose varying from 25 to 40 units) on the relationship between the plasma sugar and the corpuscular sugar in diabetic subjects

	CASE NUMBER ONE			
	Initial blood-sugar level	TIME IN HOURS AFTER INSULIN INJECTION		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	470	260	112	100
Plasma sugar, mgs. per 100 c.cm.	540	270	120	102
Corpuscular sugar, mgs. per 100 c.cm.	418	240	115	100
Plasma - corpuscular percentage difference.	23	12	5	2

Table V—contd

	CASE NUMBER TWO			
	Initial blood-sugar level	TIME IN HOURS AFTER INSULIN INJECTION		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	440	256	156	135
Plasma sugar, mgs. per 100 c.cm.	450	264	142	130
Corpuscular sugar, mgs. per 100 c.cm.	228	214	134	122
Plasma - corpuscular percentage difference.	49	19	6	5

CASE NUMBER THREE

	Initial blood-sugar level	TIME IN HOURS AFTER INSULIN INJECTION		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	280	175	80	60
Plasma sugar, mgs. per 100 c.cm.	300	184	80	60
Corpuscular sugar, mgs. per 100 c.cm.	229	150	80	60
Plasma - corpuscular percentage difference.	24	15	Nil	Nil

CASE NUMBER FOUR

	Initial blood-sugar level	TIME IN HOURS AFTER INSULIN INJECTION		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	330	210	106	70
Plasma sugar, mgs. per 100 c.cm.	390	220	102	73
Corpuscular sugar, mgs. per 100 c.cm.	280	190	96	70
Plasma - corpuscular percentage difference.	29	14	6	4

Table V—concl'd

	CASE NUMBER FIVE			
	Initial blood- sugar level	TIME IN HOURS AFTER INSULIN INJECTION		
		1 hour	2 hours	3 hours
Whole-blood sugar, mgs. per 100 c.cm.	250	130	95	65
Plasma sugar. mgs. per 100 c.cm.	280	150	105	67
Corpuscular sugar, mgs. per 100 c.cm.	210	120	90	65
Plasma - corpus- cular percentage difference.	25	20	15	3

Explanation (Table V)

It will be seen from the above table

(1) That in all the cases noted above, the initial plasma-corpuscular ratio (*i.e.*, increase of plasma sugar over the corpuscular sugar before the administration of insulin) is very high.

(2) That the plasma-corpuscular ratio decreases markedly after the administration of insulin and in some instances these sugar contents actually approximate to each other (as in a normal case).

(3) In cases Nos. 3 and 5 where hypoglycæmic symptoms developed, it will be seen that the sugar-content of all the three components of the blood, *viz.*, the whole-blood, the plasma and the corpuscular, were reduced almost equally below the normal level.

A study of the above table brings out a few very interesting facts. The most noticeable feature, as has already been pointed out, is that the plasma sugar and the corpuscular sugar either approximate to each other (as in normal cases) two to three hours after insulin injection, or, in severe cases of diabetes, the difference between them becomes much less marked. It corroborates the statement which has been made previously, that insulin does help to increase the permeability and the power of utilization of sugar in the corpuscles, with the result that the corpuscles are now able to abstract sugar from the surrounding plasma and to utilize it within their own walls, so that the plasma-corpuscular ratio becomes much less marked or may even become nil.

One of the cases (case No. 3) had symptoms of hypoglycæmia in the third hour after the injection of forty units of insulin. It should be noted that there was absolutely no difference between the whole-blood, the plasma and the corpuscular sugar in this case—all of them being the same, *i.e.*, 60 mgs. per 100 c.cm. This is rather remarkable

and is contrary to the findings of some other workers, specially that of Lee Foshay (1925) who demonstrated that insulin caused a reduction in the corpuscular sugar which is disproportionate to the reduction in the whole-blood and the plasma. Foshay explains the insulin reaction as being not due to hypoglycæmia *per se* but to cytoglycopenia. In describing one case of insulin hypoglycæmia, Foshay observed that when the whole-blood sugar was 0.197 per cent., the plasma sugar 0.220 per cent., the blood-sugar in the cells was 0.036 per cent.! Hypoglycæmic symptoms, however, really developed in this patient six hours after this result was obtained. It is as yet premature to offer any explanation of the results obtained by Foshay's above experiments, but it may be pointed out that at the time when the symptoms of hypoglycæmia really manifested themselves, no blood-tests were made. If that had been done, it would probably have been found that both the whole-blood and the plasma sugar had also fallen much below normal. I am unable, from the results of my own experiments, to support Foshay's finding that the insulin reaction is due to cytoglycopenia alone. I hold that it is due to hypoglycæmia in all the three components of the blood, *i.e.*, the whole-blood, the plasma and the corpuscles. It may be noted here that Foshay's work has not been confirmed by Trimble and Maddock, working in Folin's laboratory.

Summary and conclusions

(1) In normal healthy Indian subjects, the plasma sugar is slightly lower than the whole-blood sugar and is slightly higher than the corpuscular sugar.

(2) In diabetic subjects, things are quite different. Here the plasma sugar is almost always higher than the whole-blood sugar and also much higher than the corpuscular sugar.

(3) It may be definitely stated that the increase of the plasma sugar over the corpuscular sugar in cases of diabetes takes place according to the severity of the disease; in other words, the graver the disease, the higher the ratio of the plasma sugar over the corpuscular sugar. This is due to the inability of the corpuscles to take in and utilize sugar from the surrounding plasma.

(4) In the author's opinion, the estimation of the plasma sugar and the corpuscular sugar in cases of diabetes will give a much better indication of the nature of the disease than estimation of the whole-blood sugar alone, and the determination of the plasma-corpuscular ratio will give a much better indication of the severity of the disease.

(5) Administration of insulin in cases of diabetes mellitus has been shown to increase the permeability of the corpuscles to sugar intake and to help in the utilization and storage of sugar within their own walls.

In conclusion the author begs to thank Mr. U. N. De, B.Sc., chemist, Diabetes Research Laboratory, for much valuable assistance in carrying out the various experiments and in the compilation of the above tables.

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AVERTIN ANÆSTHESIA, A STUDY OF 114 CASES

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JUDGING from the almost complete absence of any published records describing personal experiences with avertin anæsthesia, it is fair to assume that avertin is not being used to any extent by surgeons in India.

In the following paper I record my experience of its employment in 114 cases.

No selection of cases was made, avertin having been used in all cases where it was not definitely contra-indicated.

Technique.—The instructions given by the manufacturers (Bayer) in their brochure on 'Avertin' were closely followed, except that with increasing experience larger and larger doses were used until a dose of 0.16 gm. per kilogram of body weight was reached.

On the morning before the operation a saline purgative, and in the evening a soap-water enema are given. Next day, half an hour before the time fixed for the operation avertin is administered.

Avertin is available in powder as well as in liquid form. If the powder is used, the required quantity, after having been carefully weighed, is added to distilled water at a temperature between 35° and 40°C. to form a 3 per cent. solution. It is shaken for five minutes till it is quite clear. In the preparation of the solution the correct temperature of the water is an important factor. If the temperature is allowed to fall below 35°C. avertin is precipitated and the solution should be rejected, as rewarming is not admissible. If the temperature exceeds

40°C. avertin (tribromomethylalcohol) is decomposed and hydrobromic acid and dibromacetaldehyde are formed; the latter even in small amounts is a strong intestinal irritant.

To 5 c.cm. of this solution, in a test tube, are added two to three drops of Congo-red solution (1:1,000). The resulting solution must be orange-red. A change of colour to blue indicates that the solution is decomposed and should be rejected.

Mucilage salep, milk, and normal saline solution have been used by different workers for making the solution, but in my experience distilled water proved quite a satisfactory solvent. If 'fluid avertin' (avertin dissolved in amylene hydrate and put on the market in hermetically-sealed ampoules) is used, it is recommended by the manufacturers that the exact quantity be added to distilled water at the specified temperature to make a 3 per cent. solution. The Congo-red test is obligatory whichever solvent is used, and if milk or mucilage are preferred an aqueous solution should first be made and tested.

With the patient in the moderate Trendelenburg position and turned on his left side the solution is then introduced into the rectum with a rubber catheter and glass funnel, taking at least five minutes to allow the whole dose to flow in.

Within ten minutes of administration the patient passes into a condition closely resembling natural sleep. The narcosis becomes gradually deeper and deeper and in thirty minutes reaches a stage, when, with the help of a small amount of an inhalation anæsthetic such as chloroform or ether, one can proceed with the operation.

The following list shows the variety of operations performed by me under avertin anæsthesia :—

Herniotomy for inguinal and femoral hernia 36, litholapaxy 18, appendicectomy, gastro-enterostomy and other abdominal operations 9, amputation of leg 9, removal of lymph and salivary glands 9, radical cure for hydrocele 8, suprapubic lithotomy 4, tonsillectomy 4, castration 3, trephining 3, partial thyroidectomy 2, excision of tumours 3, partial resection of mandible 2, and nephrolithotomy, excision of elbow joint, excision of calcaneus, and plastic operation on hand, one each.

To study the effects of various modifications of the original method of administration, I have divided the cases into five groups.

I. This group comprises the first 56 cases of the series. In all of them only avertin in doses varying from 0.08 to 0.1 gm. per kilogram of body weight was used.

Within ten minutes the patient passes into a condition resembling natural sleep. There is no stage of preliminary excitement or struggling as with ether or chloroform. By the end of thirty minutes narcosis is deeper, there is

general muscular relaxation, the pupils are contracted, the corneal reflex is lost, the respiration is quiet, shallow and its rate is slightly increased, a slight degree of cyanosis is observed in some cases, the pulse rate is also increased and there is a fall in blood pressure.

Though by this time the anæsthesia appears to be sufficiently deep to proceed with the operation, the application of a painful stimulus will elicit reflex movements, and it is advisable that a small amount of an inhalation anæsthetic should be given before the skin incision is made. In most of my cases chloroform was used and the amount required was usually about one-third the quantity that would have been used had chloroform alone been given.

In five cases of this group, however, avertin produced no effect beyond slight drowsiness and the amount of inhalation anæsthetic used was therefore greater. Three cases out of these five require separate comment.

(1) A female, aged 25 years. Disease, exophthalmic goitre. Received 0.1 gm. of avertin per kilogram of body weight. Forty minutes after avertin was given she was only slightly drowsy, responding rationally to every question and being in an agitated and emotional state of mind. Chloroform-ether mixture was then used. This was one of my early cases and I thought I was dealing with an exceptional case, for variation in individual tolerance to avertin is not unknown. But those who have had considerable experience of avertin anæsthesia in goitre cases have shown that this is not unusual and that tolerance to avertin in these cases is really great. It has also been shown that in these cases detoxication and excretion of avertin are also very rapid. The idea of regulating avertin narcosis by administration of thyroxine is based upon these observations.

(2) Male, aged 10 years. Disease, inguinal hernia. Received 0.1 gm. of avertin per kilogram of body weight. Forty minutes later he was still awake and noisy. He was a subject of epileptic insanity.

(3) Male, aged 30 years. Disease, inguinal hernia. Received 0.1 gm. of avertin per kilogram of body weight. Thirty minutes later he was only slightly drowsy. He was addicted to ganja.

II. This group includes seven cases only. In these cases in addition to 0.08 to 0.1 gm. of avertin per kilogram of body weight, an injection of morphine gr. $\frac{1}{4}$ was given forty-five minutes before avertin. Narcosis was decidedly of greater intensity than in the cases of the previous group, but owing to the alarming degree of cyanosis observed the use of morphine as a preliminary was soon discontinued.

III. In this group there were 31 cases. The dose of avertin varied from 0.1 to 0.12 gm. per kilogram of body weight and in addition 30 c.cm. of a 20 per cent. solution of magnesium sulphate were introduced rectally with the avertin.

The narcosis obtained was as deep as in group II without the concomitant disadvantage of troublesome cyanosis.

How magnesium sulphate helps to intensify the action of avertin is unexplained.

One case in this group deserves special mention on account of developing convulsions. The patient was a male, aged 55 years, admitted for vesical calculus. He received 0.1 gm. of avertin per kilogram of body weight and 25 c.cm. of magnesium sulphate solution. Fifteen

minutes after administration of avertin he developed clonic contractions. The movements were not violent. They appeared every forty to sixty seconds and lasted from five to ten seconds. They disappeared when chloroform inhalation was begun, but reappeared after the operation when the effect of chloroform was beginning to wear off, and lasted for about two hours further, i.e., throughout the recovery period from avertin narcosis. Convulsions during surgical anæsthesia have been ascribed to various causes such as instability of the nervous system in childhood, toxæmia, impurities in chloroform and ether, excessive stimulation of the cerebral centres by accumulation of carbon dioxide or by rapid replacement of carbon dioxide by oxygen. None of these could be said to be the exciting factor in this particular case. The patient had a stone in the bladder with a mild degree of cystitis, but how far this condition was responsible for convulsions is difficult to assess.

In this case the systolic blood pressure before administration of avertin was 150 mm. of Hg. Fifteen minutes after, it fell to 80 mm. and convulsions appeared. Adrenalin 10 minims was given and the blood pressure went up to 140 mm., but the convulsions persisted.

IV. There were 12 cases in this group. All of them received avertin-magnesium sulphate solution, but the dose of avertin varied from 0.1 to 0.15 gm. per kilogram of body weight. In addition 1 c.cm. of a 3 per cent. solution of narcophin was added to the solution.

Narcophin is stated to be less toxic than the other derivatives of opium.

The resulting narcosis was deeper than that obtained in any of the previous groups, but a small amount of an inhalation anæsthetic was still required. Cyanosis was observed to be more frequent and more pronounced but never reached a dangerous degree.

V. In the last group, which consists of 8 cases, avertin-magnesium sulphate-narcophin solution was used, but the dose of avertin was increased to 0.16 gm. per kilogram of body weight.

The patients were all healthy adults requiring operation for hernia or hydrocele, and they were selected to receive this big dose of avertin with a view to induce complete surgical anæsthesia without the aid of any supplementary inhalation anæsthetic.

In four cases complete anæsthesia was obtained, in the other four only a few whiffs of chloroform were required, when the skin incision was being made and sutured up.

Peculiar features observed in cases of this group were that respiration became extremely shallow. Cyanosis was more marked and there was a decided tendency to increased venous hæmorrhage during the operation. The fall in blood pressure was not more marked than in the previous groups.

Statistics of the series

Number of cases, 114.

Sex, 102 males, 12 females.

Age, varied from 2½ to 75 years.

Dose of avertin, varied from 0.08 to 0.16 gm. per kilogram of body weight.

Unsatisfactory narcosis, 5 cases.

Secondary effects

Cyanosis tends to be marked with increasing dosage of avertin and also when morphine is used as a preliminary to avertin.

Some fall in blood pressure is almost always present with avertin, the average being 20 to 30 mm. of Hg. It does not depend upon the dosage of the drug and should not prove a cause of anxiety, for it generally begins to rise again with the administration of chloroform or ether. Should it be very marked it can be readily controlled by an injection of adrenalin or ephedrine. The maximum fall recorded in this series was 70 mm. of Hg. In 55 cases the blood pressure was taken twenty-four hours later, and almost invariably it was found to have regained its previous level.

With doses exceeding 0.14 gm. an increasing tendency to venous hæmorrhage is observed.

Mortality

The mortality in this series was 7 per cent. All the deaths occurred in cases in which the dose of 0.1 gm. was not exceeded. It is important to refer to the fact that avertin was used without any selection of favourable surgical subjects, and that before ascribing a fatality to avertin alone, recognition must also be taken of the general condition of the patient, the nature of the disease and the operation.

The fatalities have been classified as under :—

- (a) Died during anæsthesia.
- (b) Died subsequently.

(a) One death occurred under the first heading, in a girl aged eight years, with enlarged tonsils. In addition to avertin chloroform was administered, and just before completion of the operation the patient stopped breathing. Death was apparently due to failure of cardiac and respiratory functions, and in the absence of a post-mortem examination to determine if there was any other condition present to account for it, avertin and chloroform cannot wholly be exonerated. To what extent each was responsible, it is impossible to hazard an opinion.

(b) Of the second group I give a brief history of each case : (i) Male, aged 30 years, with gangrenous appendicitis of at least thirty-six hours duration, followed by generalised peritonitis. Died ten hours after the operation. (ii) Male, aged 15 years, with moist gangrene of right leg. Died seven days after the operation. (iii) Male, aged 27 years, with compound depressed fracture of the frontal bone. Died five days after the operation. (iv) Male, aged 45 years, with direct inguinal hernia. Developed pneumonia of the right lung and died seven days after the operation. (v) Male, aged 30 years, with fracture of the vault of the skull and rupture of the middle meningeal

artery. Died ten hours after the operation. (vi) Male, aged 35 years, with advanced carcinoma of the stomach. Died nine hours after the operation. (vii) Penetrating wounds of the abdomen with perforation of the stomach. Patient developed a sub-phrenic abscess and died thirty-three days after the operation. After a careful survey of the details in each of these seven cases it may be stated that in no case was death due to avertin itself. They were all bad surgical risks, four of them being actually in a critical condition, and death did not seem to have been influenced by avertin anæsthesia.

Conclusions

Avertin is a basal narcotic of great value when used with careful attention to details of administration.

No special apparatus is required and the technique is quite simple.

Used in doses not exceeding 0.12 gm. per kilogram of body weight it is a safe and valuable drug at our disposal; the addition of narcophin and magnesium sulphate solution to it intensifies its action without introducing any extra element of risk.

Its great advantage is the total absence of the stage of excitement associated with chloroform and ether anæsthesia. This comfort of induction makes it very suitable for nervous and emotional patients.

The absence of post-anæsthetic retching and vomiting, and the great reduction in the incidence of pulmonary complications are obvious advantages.

With certain exceptions avertin can be used for almost all surgical operations. For operations on the head and neck it was found to be of especial value.

Its use in doses exceeding 0.12 gm. per kilogram of body weight is not to be recommended, as apart from the disadvantages of cyanosis and increased venous hæmorrhage produced by such doses, the margin between the safe narcotic dose and the lethal dose is greatly reduced.

It is possible to obtain complete surgical anæsthesia with avertin alone when used in sufficiently large doses (as in group V), but as mentioned above this procedure is associated with certain disadvantages and risks, and presents no outstanding advantage to recommend it.

Its contra-indications are severe renal, hepatic, and blood diseases, advanced pulmonary tuberculosis and rectal diseases. I happened to operate, however, on a case of hydatid cyst of the liver, with avertin anæsthesia, without any ill-effect. It was a very large cyst embedded in the liver which, but for portions of the right and left lobes, resembled more a thick walled sac than a solid organ.

I am indebted to Lieut.-Colonel E. S. Phipson, D.S.O., I.M.S., Civil Administrative Medical Officer, Aden, for his valuable advice and kind permission to publish this paper.

A NATIONAL DRINK OF THE HILL-FOLK OF DARJEELING

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THE hillmen of Darjeeling freely indulge in a mildly intoxicating drink called *chhang* brewed from *marua* millet (*Eleusine coracana*). This is the national drink of the people and they are permitted to prepare it up to a certain limit, without the payment of any fee. Sir George Watts in his *Dictionary of the Economic Products of India* gives the composition of *marua* grain (husked) as follows:—

Water	..	..	13.2	per cent.
Starch	..	..	73.2	"
Fibre	..	..	2.5	"
Albuminoids	..	..	7.3	"
Oil	..	..	1.5	"
Ash	..	..	2.3	"

In the manufacture of the alcoholic liquor the starchy portion is first converted into sugars which are next fermented. These changes are brought about by the activity of various moulds and yeasts, and a culture of these organisms is supplied in the form of *murcha* prepared from several ingredients. C. M. Hutchinson and C. S. Ram Ayyar describe the manufacture of *murcha* in the following manner:—

'In Darjeeling the outer skin of the root of certain wild plants [that used by the Nepalis is known to them as *blimsenpati* and was identified by the Curator of the Lloyd Botanic Garden as *Buddleia asiatica* Lour., whilst the Limboo tribes use *wading-hang-ma* (*Polygala arillata* Ham.)] is dried and powdered; four ounces of this material, half an ounce of ginger, three pieces of red pepper (chillies), and eight pounds of ground rice are kneaded into a stiff paste with water, made up into small round cakes about half an inch thick and dusted over with powdered cake from a previous batch; the cakes thus prepared are wrapped in fern leaves, placed on a mat in a dark corner of the house, and left undisturbed for three days, when they are taken out and dried, preferably in the sun, and are subsequently kept dry by hanging in a cloth above the fireplace'. These authors ascribe the saccharification of starch and subsequent alcoholic fermentation to the activity of three kinds of moulds (such as *Rhizopus cambodja*, *Dematium*, and *Penicillium*) and one kind of yeast, these organisms being introduced in the *murcha* with the jungle products, through dusting with an earlier batch,

from the air, or from the fern leaves used for wrapping the cakes. It will be noted that the enzyme amylase secreted by the moulds changes the starchy matter into maltose, which is next converted into glucose and ethyl alcohol by the maltase and zymase of yeast. Fermentation enzymes are also secreted by the moulds to a certain extent.

The different stages encountered in a brewery for the preparation of the *marua* grain may be briefly outlined as follows:—The grain is cleansed and then boiled with water until quite soft. It is next allowed to cool and thoroughly mixed with the *murcha* ferment (in the proportion of 2 to 4 cakes to one maund of the grain), and spread on the floor of the house to the depth of 8 to 10 inches, and kept in this position for about 40 hours, during which time the moulds develop and spread throughout the mass and partly saccharify the starch during their growth. Afterwards the infected material is transferred to bamboo baskets which are then wrapped up in plantain leaves, probably to prevent the introduction of extraneous organisms from the air, etc. The grain is allowed to remain in this position for 15 to 20 days so that the organisms may produce the desired effect. After this period the grain is ready for use. Some of the prepared grain is placed in a vessel consisting of a section of bamboo known as *chonga*; hot water is next poured into it and the mixture is left for a while. The liquor is next imbibed through a thin reed or bamboo pipe. The vessel may be replenished repeatedly with hot water until all virtue has gone out of the grain. The alcohol-content of the liquor when used in this manner is very low, less than 1 per cent. by volume; no wonder, then, that men, women and children delight to sip it at all times from morning till night. It is only when the fermented grains are steeped in an equal amount of water for 24 hours that the percentage of ethyl alcohol rises to 6 to 8 per cent.

The beverage is not only a solution of ethyl alcohol in water but it also contains other substances derived from starch, namely, dextrin, malto-dextrin, and maltose which has not been fermented. It is thus a food as much as a drink. The chief by-products (the nature and proportion of which depend upon the character of the grain and of the yeast) in all fermented liquids are glycerol (derived from the decomposition of sugar by yeast), succinic acid and fusel oil (formed from the amino-acids which in turn result from the decomposition of proteins in the grain and also in the yeast), formic, acetic and other acids (from bacterial side fermentation, etc.), and the various aldehydes and esters.

(Ref.—'Bakhar: The Indian Rice Beer Ferment'—Memoir of the Department of Agriculture in India, Bacteriological Series, Vol. I, No. VI.)

A SHORT ACCOUNT OF A RECENT OUT-BREAK OF DIPHTHERIA AT RAJKOT, WITH SPECIAL REFERENCE TO THE CARRIER PROBLEM

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T. H. TRIVEDI, L.M.P. (U. P.), L.T.M. (Cal.)

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Rajkot

ON Saturday, 18th July, 1931, at the usual weekly visit of one of us to the Rajkumar College the S. M. S. Officer in charge had kept four cases of sore throat for inspection. He also reported that sore throat was very prevalent that week, several other boys having complained.

On inspection of the throats of the four boys detained, a generalised congestion of the fauces, tonsils, and soft palate was observed, with, in two cases, a greyish translucent film on the tonsils, not amounting to a membrane, but enough to arouse suspicion. It was deemed best, in the circumstances, to take swabs from all the boys complaining of throat symptoms, ten in number. This was done forthwith with the result that the Klebs-Loeffler bacillus was isolated in five of the ten cases examined.

This impressive result was not so unexpected as might be imagined. Some time previously one of us had seen, in consultation with a local practitioner, a case of palatal paralysis, which upon swabbing proved to be diphtheritic in origin. More recently the grandson of a retired official had been admitted to the West Hospital on the fifth day of an attack of diphtheria, and had died of toxæmia and heart failure in spite of massive injections of antitoxin.

The five boys, who included the four who had been inspected, were forthwith isolated in the sanatorium, and a trained nurse, previously protected by a prophylactic injection of 2,000 units of antitoxin, was engaged.

Coincident with the isolation of the infected boys, their attendants and servants were segregated and bacteriologically examined. Of the latter, one case the adult servant of one of the boys, was found to be infected and was isolated and treated.

The remainder of the college was placed in quarantine and diphtheria toxin, virulent and neutralised, for the Schick test was obtained from Burroughs Wellcome and Co., Bombay. On 22nd July, 1931, the Schick test was performed upon the 23 remaining boys of the College, upon the European teaching staff, and the medical attendants. On the 23rd the first reading was made, 11 boys giving a positive or \pm reaction, and 12 negative. Of the staff one gave a positive reaction, and one medical attendant also proved susceptible. On the same day the boys and staff who were susceptible were given 2,000 units of antitoxin and the quarantine on the college was lifted. On 24th two boys

who had at first given negative reactions to the Schick toxin exhibited delayed positive reactions and were protected.

No further case occurred in the Rajkumar College.

Cases of diphtheria, however, continued to occur in widely different localities of the civil station and city, suggesting that it was a 'carrier' outbreak, since the cases detected had little or no personal contact with one another. It is well known that individuals may carry the bacilli for years in their throats, without any symptoms; but if such individuals come into contact with others more susceptible, the latter may produce a typical clinical attack. Malnutrition and ill-health from any cause, but especially from infections of the respiratory tract, are factors which will tend to increase the susceptibility. Meanwhile the infecting person remains not only unrecognised but unsuspected. Now it is noteworthy that the outbreak commenced in July, when the arrival of the monsoon produced a drop in temperature and a temporary increase in respiratory diseases, and that the case incidence and virulence increased in the latter half of October, when a sudden cold snap produced a similar 'spurt' of respiratory troubles.

Diphtheria being primarily a disease of children between the ages of 2 and 12, it was probable that most of the carriers were to be found among individuals of that category. Accordingly, with the co-operation of the educational authorities, it was decided to undertake a systematic survey of the children attending all State-aided schools, with a view not only to detecting the individuals who were probably the main factors in the spread of the disease, but also to obtaining data as to the proportion of carriers among school children.

This investigation was carried out between 11th December, 1931, and 24th February, 1932, in 11 schools having a total strength of 2,232 children of whom 1,925 were examined both by direct smear and culture. The results are summarised in the attached table, and it will be observed that out of 1,925 children examined 53 or 2.75 per cent. were found positive to the Klebs-Loeffler bacillus. Regarding sex incidence, of 1,348 boys examined, 34 (2.52 per cent.) gave positive results, while of 577 girls, 19 (3.29 per cent.) were found infected. In addition, out of 46 children in the Police Headquarters Lines (sex not noted) 1 was found to be a carrier, a percentage of 2.1.

Remarks.—The impression appears to prevail among the medical profession in this country that diphtheria is a disease of temperate climates only, and that its incidence in India is confined to localities such as hill-stations, where the climate approximates to the temperate. Such, at any rate, was the teaching when the two juniors of us were students; and conversation with colleagues more recently

TABLE

Name of school	Total children	Total examined	Total positive	Percentage of positives
Boys' School, No. I	386	316	5	1.58
" " " II	274	263	6	2.28
" " " III	249	202	5	2.47
" " " IV	232	196	6	3.1
" " " V	97	89	2	2.25
" " " VI	293	246	10	4.07
" " " VII	50	36	Nil	Nil
Girls' " " I	203	187	8	4.28
" " " II	245	232	7	3.02
" " " III	108	80	2	2.5
" " " IV	95	78	2	2.56
TOTAL	2,232	1,925	53	2.75

qualified confirms the impression that it persists. If so, the figures quoted above would appear to indicate that this teaching is fallacious and requires revision.

One of us (J. B. H.) has met with cases of active virulent diphtheria in the plains of the United Provinces, in the riverine tracts of the Indus valley (where the climate can hardly be characterised as 'temperate'), in Rajputana, and finally in Kathiawar. It is possible that in the plains the virulence of the infection is less than in cooler localities. In the outbreak under discussion of the 80 odd cases that came within our purview only 3 were serious and of these 2 were fatal. This proportion is not great when it is considered that these cases were seen at all stages of the disease.

In our opinion, however, the significant feature of the investigation is that in a plains station in India nearly 3 per cent. of apparently healthy school children have been proved to be carriers of the diphtheria bacillus; and the logic of these figures is irresistible; namely:—

(1) that no sick child has been properly examined until the fauces have been thoroughly inspected in a good light, and (2) that, while it is wiser to swab all cases of sore throat, the slightest sign of exudative pharyngitis—no matter how obviously non-diphtheritic it may appear—is an imperative indication for this measure. We are tempted to add a third conviction: that a patient suspicious-enough looking to be swabbed is a patient who should receive antitoxin. We believe that adherence to this maxim would save much discomfort and an appreciable number of lives.

The writers are indebted to Rao Sahib M. S. Dvivedi, Educational Officer, W. I. S. Agency, and to the headmasters and headmistresses of the schools concerned, for their whole-hearted co-operation, which greatly facilitated the investigation. They also have to record their appreciation of the help of Dr. Abdulkadir A. Lahji, L.C.P.S., Inspecting Medical Officer of Schools, and Dr. (Mrs.) Jankibai Kithurkar, L.C.P.S., upon whom rested

the responsibility of taking swabs from boys and girls respectively.

Summary

(1) An account is given of an outbreak of diphtheria in a plains station.

(2) Consequent investigation revealed that 2.75 per cent. of apparently healthy school children had Klebs-Loeffler bacilli in their throats.

(3) It would appear that diphtheria is not only a disease of temperate climates but is a factor to be reckoned with in the plains of India, though possibly less virulent there than in more temperate zones.

(4) The importance of routine swabbing of all cases of exudative pharyngitis, and of the administration of antitoxin 'on suspicion' is emphasised.

PRIMARY BRONCHOGENIC CARCINOMA

By S. C. SEAL, M.D.

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IN recent medical literature we find an unusually large number of reports of primary carcinoma of the lung. This undoubtedly shows a gradually increasing frequency of the disease. Not very long ago, primary carcinoma of the lung was looked upon as a rarity and Adler (1912) could collect reports of only 374 cases for his monograph. But within the last few years there has been an enormous increase in the incidence of such cases, so much so, that it is now regarded everywhere not as a rare but a common form of neoplasm. Weller, MacCreae, Funk, Chandler and Chevalier Jackson, all have collected a good number of cases. Taking an average of the statistics of Duguid, Berblinger, Staehelin, Wahl and Probst, it can be concluded that about 5 per cent. of all cancers arise in the lungs and that it is almost one-third as common as gastric cancer. Ewing (1928) says that 1 per cent.

of all lung tumours are cancers. Simpson (1929) and Davidson (1929) observe that the increased frequency of pulmonary carcinoma is real and not merely apparent. The same view has been expressed by Wynn (1931), Moise (1921) and Barron (1922) as well as by Huguenin, Menetrier and Lettule of Paris. Of course, part of it is explained by an increased number of necropsies added to the improvement in clinical diagnosis specially with the help of bronchoscopy, thoracotomy, and modern improved technique of x-rays with lipiodol. But Fried (1925) holds the latter view to be entirely responsible for the apparent increase. Turnbull, Barnard and Shennan suggest that the so-called tumours of the mediastinum formerly regarded as lymphosarcoma are in reality bronchogenic carcinoma.

There are very few cases of bronchogenic carcinoma actually on record in this country. In Calcutta, Dutta Gupta (1931) reported one case a few months ago, in which the diagnosis was made from the histopathological section of a skin nodule that came out as a secondary metastasis. Recently, two cases were simultaneously admitted into the Calcutta Medical College Hospital. One, a case of Dr. U. P. Basu, left the hospital very shortly after admission, after it was clinically diagnosed as a case of primary bronchogenic carcinoma from the x-ray examination with injection of lipiodol. The second case is the following one, also diagnosed clinically and confirmed later on, by a partial necropsy.

Patient, R. D., Hindu male, aged 50 years, a shop-keeper, was admitted under the late Dr. B. L. Majumdar, on the 8th May, 1931, for low irregular fever with cough, occasional hæmoptysis, difficulty in breathing, pain in the left shoulder and rapid emaciation—of about a year's duration.

History: He had been enjoying practically normal health when, about a year prior to his admission, he got an attack of fever with chill and cough, from which he apparently recovered in a few days time. This was followed some time afterwards by a low evening rise of temperature with persistent cough, occasional hæmoptysis and sweating at night. Since that time he also had several attacks of violent dyspnoea lasting for two to three days each time and relieved only with great difficulty. Besides, for the last six months he had been suffering from a dull aching pain over the left side of his neck, with periods of remission and exacerbation. This became constant and intensely agonising for the last few days and forced him to seek admission into the hospital. He complained that the left side of his chest was much heavier than the right side. He became progressively pale and emaciated, had no appetite and was very much constipated.

History of previous illness and family history were both non-contributory. He was not addicted to any kind of intoxicant and had not suffered from any venereal disease.

On admission, the patient's general condition was found to be very bad. He was extremely emaciated, slightly cyanosed and with laboured and hurried breathing; mouth foul, tongue coated and dry. Temperature 99.4°F., pulse feeble, 104 per minute, respiration 36 per minute. No bony outgrowths nor deformity nor glands were found enlarged anywhere. Testes and prostate were apparently normal. Veins of

the left axilla were prominent and those of the neck were visibly pulsating.

Chest: Intercostal spaces prominent; movement on the left side almost nil; constant dyspnoea present; a diffuse wave of pulsation was visible over the precordium. Heart: Apex beat very feeble in the left fifth intercostal space just inside the nipple line. The area of cardiac dullness on the left side was found to be completely merged into the dullness present over the left half of the chest; the other side was within normal limits; first sound at the mitral area—short and muffled almost replaced by a localised systolic murmur; second sound at the pulmonary area greatly accentuated. Pulse—small, rapid and compressible but fairly regular, 104 per minute.

Right Lung: resonant; signs of chronic bronchitis were present. Left Lung: the apex felt like a nodular hard mass the size of a cricket ball, adherent to the skin of the neck; very dull on percussion throughout, except at the base where the note was rather flat. Breath sounds almost absent in the upper half except a very high pitched tubular sound at both inspiration and expiration; near the base it was tubular in character and a few râles were also heard. Both vocal resonance and vocal fremitus were absent except at the base.

Digestive system: Severe anorexia and constipation present. No other abnormality found.

Nervous system: normal. Skin: healthy. Urine: free and normal.

Laboratory findings:—

Blood: Hæmoglobin—60 per cent.; total erythrocytes—3,250,000 per c.mm.; total leucocytes—15,600 per c.mm.; polymorphonuclears—95 per cent.; lymphocytes—1 per cent.; monocytes—3 per cent.; eosinophiles—1 per cent.; no abnormal cells found.

Blood pressure: systolic—90 mm. of Hg.; diastolic—75 mm. of Hg. Blood sugar: 12 per cent.; Wassermann reaction of blood—negative. Sputum—muco-purulent with streaks of blood; red cells, pus cells present; no acid-fast bacilli were found on repeated examination.

Urine and stools—no abnormality found.

The skiagram (Fig. 1) showed complete opacity of the left lung. The heart was not displaced towards the right; the ribs were not flattened and the intercostal spaces were normal. The appearance suggested an atelectasis of the lung, possibly (*vide* history) due to bronchogenic new growth. Unfortunately, a further investigation with lipiodol could not be done owing to the patient's serious condition.

The characteristic onset, suggestive appearance and age of the patient, history of irregular low type of fever with cough, hæmoptysis and occasional paroxysmal dyspnoea, intolerable gnawing pain in the neck and progressively increasing symptoms, cachexia and cyanosis, together with physical findings such as extreme limitation of the respiratory movement on the left side, merging of cardiac dullness with that of the left side of the chest, absence of vocal fremitus and vocal resonance, a palpable adherent hard mass at the apex of the left lung, negative Wassermann reaction, repeatedly negative sputum for acid-fast bacilli and lastly the radiological appearances, all were in favour of an atelectasis of the left lung, possibly due to some bronchogenic growth infiltrating its substance.

The question of mediastinal growths was left out on account of the absence of the characteristic signs and symptoms (except dyspnoea and cough), and of the extensive involvement of only one lung and the x-ray picture. Other



Fig. 1.—Skiagram of lung.



Fig. 2

Fig. 2.—Posterior view of the actual specimen.
 L—Left lung cut longitudinally, showing heavy infiltration.
 A—A glass rod showing the actual position of the growth in the left bronchus at its bifurcation.
 R—Right lung cut longitudinally, showing normal appearance.
 G—Infiltrated bronchial glands.
 H—Heart.



Fig. 3.—Microphotograph of a portion of the tumour in high power, showing the characteristic 'oat-shaped cells' and mitotic figures.

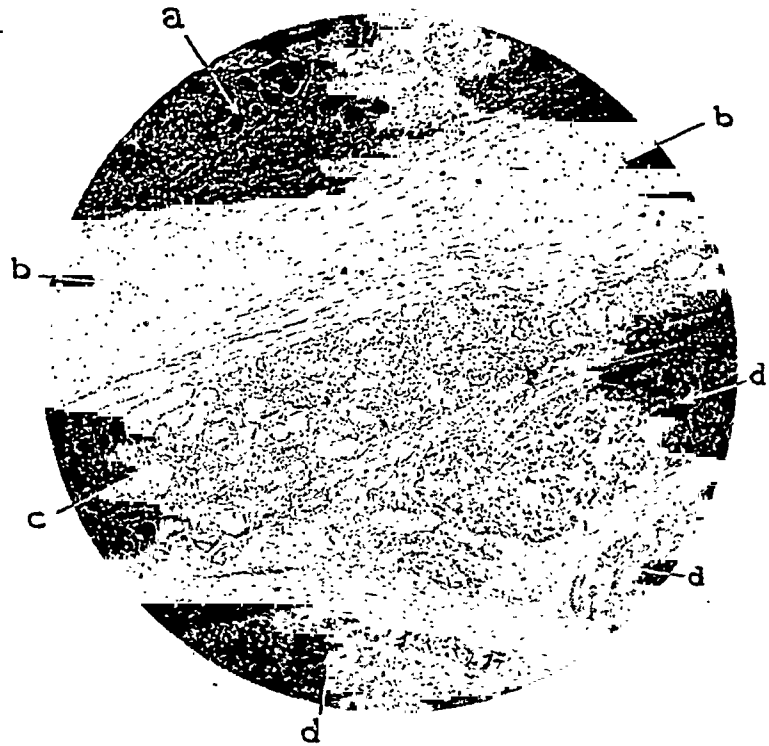


Fig 4

Fig. 4.—Low power view of the section through a bronchiole.
 a—Mucous membrane.
 b—Cartilage of the bronchiole.
 c—Mucous glands.
 d—Tumour cells,

causes of bronchial obstruction leading to an atelectasis of the lung were abandoned on the same grounds.

Absence of acid-fast bacilli on repeated sputum examination and the character of the skiagram excluded tuberculosis. The idea of free fluid in the pleural cavity did not arise because of the non-obliteration of the intercostal spaces and non-displacement of the heart, and that it was neither due to any encysted fluid or a large hydatid cyst was amply proved by the physical and x-ray findings.

Treatment was carried on on symptomatic lines only and the patient gradually went down hill and died at 11 a.m. on the 17th May, 1931, nine days after his admission into the hospital. A partial necropsy was done the same day at 5 p.m.

Post-mortem findings:—

Left lung and pleura—The apex was found adherent to the wall above. The lung, in its entirety, felt firm and hard. The pleura was considerably thickened throughout, 8 mm. thick at the base and 5 mm. at the upper part. The parietal layer of the pericardium, on the left side, was also very much thickened and firmly united to the adjacent pleura. Patchy thickening was present over the visceral layer of the pericardium, markedly over the roots of the great vessels, and a characteristic 'milk spot', 1 inch \times 1½ inches, was found over the front of the ventricles. The lobes were uniformly bound together and the interlobar portion of the pleura was very much thickened. The hilum glands were all enlarged and matted together, and on section they were found to be grossly infiltrated with the growth.

On cutting into the large bronchi, a papillomatous growth was found completely blocking the left bronchus at its bifurcation. This is well shown in the photograph of the specimen (Fig. 2). The substance of the lung felt fairly firm and resistant. The bronchioles were all dilated and thickened. On section, the lung showed areas of collapse with scattered areas of consolidation which were more marked near the hilum, evidently from infiltration by the growth. A large area, 2½ inches \times 3 inches, in the upper lobe had undergone a colliquative necrosis. No tubercle bacilli were found in the smear examination.

Right lung and pleura—No marked abnormality present.

Pericardial sac—Contained about 2 oz. of clear fluid. **Heart**—No obvious change in size or shape; the roots of the great vessels were thickened and infiltrated with the growth.

Esophagus and other mediastinal organs were free, except the infiltrated glands.

Microscopically—The growth consisted of elongated columnar or oat-shaped cells arranged in groups. Evidence of rapid multiplication was shown by the presence of many irregular mitotic figures (Fig. 3). The growth started from the bronchial mucous membrane and is found to penetrate into the deeper tissues (Fig. 4). The glands also showed heavy infiltration with the same characteristic 'oat-shaped' cells.

Comment

Before it is declared that the growth is bronchogenic, the possibilities of its origin as lymphosarcoma, lymphogranuloma, endothelioma of the pleura, tumour of thyroid or thymus with lung involvement, and lastly as secondary metastasis should be excluded.

The structure of lymphosarcoma is rather specific. It presents a diffuse growth of round

lymphoid cells lying in the reticular tissue. In this specimen the tumour is composed of oat-shaped cells, and the bronchial glands from which the lymphosarcoma usually arises, also show the same character microscopically.

Mediastinal lymphogranuloma, which may form the chief lesion in Hodgkin's disease, resembles the sarcomatous type, being composed chiefly of large round cells with a few lymphocytes, giant cells and eosinophiles with both local invasive properties and secondary deposits. These characters were entirely absent in this case. Furthermore, no glands were found enlarged elsewhere.

The pleura was not involved at all by this growth. The lung receded due to collapse, in consequence of which the pleura became very much thickened showing no structure characteristic of endothelioma.

The thyroid gland was found normal and nowhere in the growth was the typical alveolar structure of thyroid tissue found.

Tumours of thymic origin are either lymphosarcoma or carcinoma. The tumours usually occupy the anterior mediastinum surrounding and compressing the mediastinal structures. Microscopically, thymic lymphosarcoma shows lymphocytes, plasma cells and occasionally giant cells; while thymic carcinoma presents columns of large, flat or polyhedral cells, or sometimes cubical cells forming alveoli. All these characters were absent in this case. Lastly, the lung might have been involved as a secondary metastasis, but no evidence of any primary growth could be detected elsewhere in the body.

Now let us consider the microscopical appearances found in this case. Simpson, from the experience of his 139 cases, definitely concluded that the typical 'oat-celled' tumours were carcinomata of bronchial origin. They may arise from any of the three sites, viz., the bronchial mucosa, the bronchial mucous glands and the alveolar epithelium. Those that arise from mucous glands present the structure of an adenocarcinoma recalling the mucous glands of the trachea and bronchi. The cells are usually of small size and cubical or polymorphic, while high cylindrical or squamous cells are missing, and the secretion of mucus is a prominent feature (colloid cancer). Tumours arising from the alveolar epithelium are either diffuse or multiple and nodular, composed of cuboidal, cylindrical or squamous cells partially or completely filling the air vesicles; while papillary projections from atypical proliferation of the lining epithelium, the presence of very high cylindrical cells (oat-shaped cells) and their persistence in metastases accord best with an origin from the bronchial mucosa (Reinhard, Chiari, Tillmann and Beck). This last character was typical in the present case. Thus, on the evidence of its histological structure, gross anatomy and clinical history, we are

reasonably certain that the case was one of primary bronchogenic carcinoma having its origin in the bronchial lining epithelium. One important feature of the case was the absence of extensive dissemination.

Conclusion

(1) A case of primary bronchogenic carcinoma has been described, the diagnosis of which was made before death.

(2) The typical post-mortem appearances and the histological nature of the case are noted.

(3) Cases of primary bronchogenic carcinoma of the lung are probably not rare in this country, but for want of facilities for post-mortem examinations such cases escape notice.

I am grateful to Dr. M. N. De, M.B., M.R.C.P., Resident Physician, under whose guidance the post-mortem and histological examinations were done and for his kind permission to publish the notes. My thanks are also due to Mr. Susil Bhattacharya, the artist of the Pathology Department, Medical College, for kindly doing the photographic work.

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AN OUTBREAK OF EXFOLIATIVE GLOS-SITIS IN AN ASSAM JAIL

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IN the late autumn of 1931 a steadily increasing number of prisoners in the Gauhati Jail began to complain of pain in the tongue, mouth and gullet. The jail is one occupied in the main by men serving long sentences and has accommodation for 400 prisoners.

Owing, however, to the present economic distress, there has been considerable overcrowding, amounting throughout the last year to a hundred or even more in excess. On admission prisoners are often half-starved and a large proportion fall far short of their physical equivalent weight.

The jail enclosure occupies an area of three and a half acres on low-lying land, which becomes water-logged after heavy rain, and along one side runs a crowded bazaar, from

which at certain seasons flies infest the jail and are responsible for many cases of dysentery. In this respect 1931 was a particularly bad year. The climate of Gauhati (in common with the rest of the Assam Valley) is remarkable for an extreme degree of atmospheric humidity, which from June to September ranges between 90 and 100 per cent., and at this time the climate is hot and oppressive. The average rainfall is 65 inches the greater part of which falls during these months; in 1931 it was in excess by 10 inches.

The standard jail diet for those on hard or medium labour is as follows:—

Early morning meal

Rice	.. 2	chittaks
Salt	.. 1/8	chittak

Midday and evening meals

Rice	.. 10	chittaks
Dal	.. 2½	" (Musur and Arhar dal is supplied).
Vegetables	.. 3	"
Mustard oil	.. 1/4	chittak
Salt	.. 5/16	"
Condiments	.. 1/8	"
Antiscorbutics	1/8	"

The condiments are tamarind 1/16, turmeric and chillies 1/64 each, coriander seed 1/128 and onion 3/128. Antiscorbutics are generally tamarind, sometimes mango or roselle.

In addition, at two meals a week fish, 1 chittak, is given in place of an equal quantity of dal.

During the cold weather fresh vegetables are available of excellent quality, but in the rains some difficulty is experienced in maintaining an adequate supply.

The diet although monotonous appears ample and almost all prisoners thrive on it; indeed during the political troubles of 1930 when the jail was filled to overflowing, this class of prisoner, who in the main came from a somewhat better social grade, showed on release an average increase in weight of 8 lbs. It undoubtedly compares very favourably both in quality, quantity and preparation with the diet to which the villager is accustomed. Rice is the staple diet of Assam and mustard oil is universally used, only the well-to-do employ ghee. The rice is husked by *dhenkie* as in the villages, and thus retains much of the aleurone layer and some of the pericarp.

In addition a small quantity of uncooked rice bran is given at the early morning meal. Carbohydrates, however, appear to be in marked excess and animal fats are entirely absent from the dietary.

About one-third of the total jail population were attacked; 127 of these were selected for this enquiry, though it was not possible to follow this number throughout, as the population of a jail is not a permanent one.

In the earliest stages the tongue showed one or more patches of desquamation, situated as

a rule at or near the tip, whilst the remaining mucosa was furred, sodden and pale yellow in colour. The papillæ, especially in the anterior half and on the margins, were raised and generally stood out as bright red points. At the angles of the mouth fissures were often present, covered with white, sodden epithelium, and very painful. In a few cases there was mild ulceration of the inner aspect of the lip and cheek.

As the case progressed, desquamation increased, spreading down the centre of the tongue, leaving at the sides a narrowing margin of heaped up unhealthy epithelium, through which the hypertrophied papillæ protruded.

In the most advanced stages, the patient displayed a large, red, glazed and flabby tongue, from which all the superficial epithelium had been denuded. At the sides deep indentations were caused by the teeth, and the tongue was fissured both longitudinally and transversely. Within these fissures enlarged and congested papillæ could be seen, whilst the tongue was in a state of constant movement from the independent contraction of its component muscles.

The ulceration at the angles of the mouth had usually disappeared. Saliva dripped freely from the corners of the mouth and the pharynx was in some cases red and glazed. Subjectively, the usual complaint was one of pain on eating and swallowing, showing that the condition was present further back also, the angles of the mouth were especially tender, but occasionally when denudation was complete, nothing was felt.

In severe cases drinking water and even moving the tongue gave rise to discomfort. Gastro-intestinal symptoms occurred in 37 per cent., these included acid eructations, flatulence, abdominal pain (generally localized around the umbilicus) and a sense of oppression after meals. Tingling of the hands and feet was found in three cases (2.75 per cent.) and symmetrical eruptions resembling pellagra on the extensor surfaces of the wrists and feet in two, scrotal eruptions were entirely absent. The stools showed no obvious abnormality and in no way resembled those of sprue, being the pale and copious motions of men living on a vegetarian diet. The general statement was that they passed two or three semi-solid stools daily, thus in no way differing from the rest of the prisoners. Analysis of their previous history showed that no less than 40 per cent. of the patients had been admitted to hospital within the previous three years for dysentery or looseness of the bowels, whereas a random sampling of the remainder showed an incidence of 32 per cent. only.

The common dysentery in Assam is due to *B. flexner* and all our dysentery cases in this series were of bacillary type. It seemed therefore at the outset that an intestinal intoxication might be a predisposing cause, a conclusion

gaining some support from the fact that nineteen prisoners only showed a recent gain in weight, whilst 108 had lost an average of over six pounds from their recorded maximum, and this in the cold weather when weights are generally above those at other times. Much stress cannot be laid on this however, as the men may well have been reluctant to eat, on account of pain. Rather remarkably the length of their stay in jail appeared to have little relation to the severity of the lesions.

Taking two groups of cases, the early and advanced, and, neglecting those of moderate degree, and dividing them (somewhat arbitrarily) into two groups which had been more and less than one year in jail, we find:—

	Early	Advanced
Less than one year ..	9	15
More than one year ..	23	42

i.e., a ratio that is almost identical.

Of the fifteen advanced cases developing in less than one year all but three fall into the age period 25–35. The earliest advanced case had been only six weeks in jail; there was no pain and desquamation was complete, so it is possible that the condition was of old standing, though no previous history could be elicited. Another case in whom the epithelium appeared to be regenerating, had been in jail for two months only. Other short periods were four months (one) and five months (two). Amongst the early cases, one had been in jail for two months only, whilst another had been in for twelve years; neither had had dysentery. Eighteen cases (14 per cent.) had developed after a stay of six months or less.

Repeated examinations of patients admitted to the Sadar Hospital, Gauhati (who came from the same class economically), failed to reveal any such cases.

Save for the absence of skin lesions (which were present in two cases only, and these of somewhat doubtful nature) the diagnosis of an early pellagrous condition, comparable to that of black tongue in dogs (Wheeler), seemed a probable one. It was moreover possible that owing to the comparatively feeble sunshine at this season of the year, dermatitis had not developed, and it must be remembered that in Assam the sky is overcast for the four hottest months, and excessive insolation does not occur. The time required for its development corresponded exactly with that of a similar outbreak in Nyasaland (McKenzie), where, too, January and February were noted as the months of incidence.

Colonel J. P. Cameron, I.M.S., had noted a similar condition in the Madras jails, where it had been attributed to an excess of condiments in the dietary. The absence of animal fat was also a possible factor.

To test these various hypotheses, a series of experiments were made, which to avoid confusion may now be briefly summarized:—

(1) All cases were divided into two groups, each containing approximately equal numbers of early, medium, and advanced cases. All were put on a diet containing no chillies but in other respects standard; group A had no treatment, group B received two drachms of cod-liver oil daily for three weeks (*i.e.*, from 1st February 1932 to 21st February 1932).

(2) On 4th March, 1932, two further groups were taken, and placed on yeast, 1 oz. daily. The yeast was made up with warm water, sugar and essence of lemon flavouring and formed a palatable drink which almost all took readily, though a few Mahomedans objected to its somewhat alcoholic odour.

Group C contained men who had had cod-liver oil treatment. Group D those who had had no cod-liver oil.

A number were still retained in group A as controls.

All groups remained on the non-irritant diet. The yeast treatment was continued till the 22nd March, 1932.

(3) On 23rd March, 1932, a first assessment of results was made, and on 24th March, 1932, a few cases of groups A and B who were showing little or no improvement were placed on 1 oz. yeast daily for six days (group F).

Results on 23rd March, 1932.

Group A, no treatment

Result	Early	Medium	Advanced	Total
No change or worse.	3	3	4	10
Improved ..	2	2	3	7
Cured or almost cured.	2	4	10	16

i.e., seventy per cent. of cases showed either cure or benefit from a non-irritant diet.

Group B, cod-liver oil

Result	Early	Medium	Advanced	Total
No change or worse.	4	3	5	12
Improved ..	..	3	5	8
Cured or almost cured.	7	5	8	20

i.e., again seventy per cent. showed cure or improvement.

(Note.—One late case in this group had been suffering from beri-beri and was placed on a rich protein diet. He is shown under cured).

Group C, cod-liver oil and yeast

Result	Early	Medium	Advanced	Total
No change or worse.	..	1	..	1
Improved ..	..	2	..	2
Cured or almost cured.	2	3	5	10

i.e., 92 per cent. under yeast and cod-liver oil showed either cure (77 per cent.) or improvement.

(Note.—In this group one case whilst under cod-liver oil had progressed from medium to advanced. He is shown under the medium group as now cured).

Group D, yeast only

Result	Early	Medium	Advanced	Total
No change or worse.	1	..	..	1
Improved ..	1	1	..	2
Cured or almost cured.	2	2	9	13

i.e., 93.75 per cent. showed either cure (81.25 per cent.) or improvement on yeast alone.

The close correspondence between groups A and B and again between groups C and D should be noted.

From 24th March, 1932, all prisoners in the various groups were placed upon the standard dietary with a full amount of condiments.

On 18th April, 1932, the results were again assessed. Certain prisoners having been released in the interval, the totals do not correspond entirely with the foregoing, though sufficiently nearly so to form a basis for comparison. They may be thus summarized.

Group A.—Of thirty-one cases, nine showed active lesions (29 per cent.). Ten of the worst of these had received six days treatment with yeast and will also be shown under group F.

Group B.—Of thirty-eight cases, six showed active lesions (16 per cent.), of these ten of the worst had received yeast, as above.

Group D.—Of fifteen cases two showed active lesions (13 per cent.). Placing together group A and B, active lesions were present in nearly 22 per cent. as against 7.4 per cent. in group C and D; *i.e.*, three times as frequently.

Of the two cases who were not cured by yeast, one showed definite improvement, whilst the other appeared to be growing steadily worse.

Group F.—This comprised men from groups A and B whose condition had shown little any change. They were on a spiced diet and took yeast only from 24th March, 1932, to 2 March, 1932 (6 days). Of the twenty men in this group, 11 were cured or almost cured, improved, whilst eight remained unchanged.

As noted above these men were also included in the 18th April, 1932, assessment of groups A and B, without them the figure for men showing active clinical lesions would undoubtedly be considerably higher.

Conclusions

There appears to be a strong probability that this outbreak of irritative glossitis was dependent on three factors.

(a) A predisposition from weakening of the resistance of the alimentary tract from dysentery or other bowel disorders.

(b) The somewhat large quantities of irritant spices in the standard jail dietary.

(c) In certain cases a lack of vitamine B₂. Absence of animal fats from the dietary does not appear to be of importance. It would appear desirable to reduce the amount of chillies given and to include at certain seasons a ration of yeast once or twice weekly. The condition has evidently a seasonal incidence as no fresh cases occurred during the period of this investigation.

Summary

An outbreak of irritative glossitis occurred amongst the prisoners in Gauhati Jail at the end of 1931 and the early months of 1932.

Seventy per cent. of cases recovered on a diet from which condiments were removed, and the addition of 1 oz. of yeast daily to the diet raised the recovery rate to over ninety per cent. Antecedent dysentery seemed to play a part in the etiology. Although the jail diet contains no animal fats, the administration of cod-liver oil was without effect.

My thanks are due to Colonel R. McCarrison, I.M.S., and Colonel F. P. Mackie, I.M.S., for their valuable suggestions.

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THE MODERN INTRACAPSULAR OPERATION FOR SENILE CATARACT

(ACCORDING TO STANCULEANU-TÖRÖK-ELSCHNIG TECHNIQUE)

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EVER since the introduction of the limbal operation by Daviel, the trend of opinion in ophthalmology in successive generations has been towards the intracapsular extraction of the senile cataract, and the reason is not far to seek. The attractions are, the maximum visual acuity that can be got if all goes well,

the comparative freedom from post-operative irritation and the very much shortened period of convalescence, which means so much to a patient in India, who comes to an eye hospital generally from a long distance and with limited finances. But the attendant risk of vitreous loss and other consequent complications have always been a factor against its routine adoption.

Pagenstecher is responsible for having given the start to intracapsular extraction, but it is only within the last twenty years that more frequent and concerted action has been taken to perfect and simplify the operation and make it as free from risk as possible.

In this attempt, India can claim a large share, thanks to Smith of the Punjab, who developed on Mulroncy's technique. This 'Smith operation', as it is called, has a widespread reputation and is perhaps given the preference still by some in this country, especially in the north. But, it is well recognised that it is unsuited for general adoption on account of the very severe pressure required to express the lens and the consequent risk of trauma to the deeper parts of the eye—however much Smith may assert to the contrary—and of prolapse of vitreous and other attendant complications.

As against this, a good deal of interest was aroused when Barraquer claimed that with his *crisaphake* he was able to deliver the lens by suction with the least trauma to or pressure on the tissues of the eye. It need hardly be added that that interest is now waning. The danger of sucking out the vitreous, the operative complexity, the liability of the apparatus to get out of order at any moment, and its cost among other things, are against its adoption by every surgeon.

Kuhn's attempt to rupture the zonule with a special instrument and then express the lens in the capsule is now only of academic interest.

Stanculeanu and Knapp have been practising the dislocation of the lens with a grip on the anterior capsule with a forceps, and then expressing the dislocated lens in its capsule with external pressure on the eye more or less as in Smith's operation. The object was to avoid the terrible force needed in the Smith operation to break the fibres of the zonule.

Török went a step further. Instead of leaving aside the capsule forceps after the dislocation, he retained the bite on the capsule and used it to pull out the lens, accompanied at the same time by counter-pressure from outside on the limbus with a hook.

Elschnig of Prague has made this operation yield more successful results with orbital akinesia, bridle suture, ciliary block, wound suture and other smaller details in the operative procedure. This intracapsular method of Stanculeanu-Török-Elschnig has found favour with most of the leading eye surgeons of

Europe and is being successfully tried in the chief clinics there.

From the beginning of 1930, we have, in this hospital, given an extensive trial to this method of extraction, with slight variations of our own in the details and have found it to be an operation of relative safety, when compared with all the other intracapsular operations. While we hold that each cataract must be treated on its own merits and no single particular procedure can be applied indiscriminately to all cases with equal success, we can lay claim to the fact that this Stanculeanu-Török-Elschnig technique has been safe enough for a majority of our cases.

Of the 2,000 cataracts that we have operated on within the last twenty-eight months—from January 1930 to March 1932—1,048 were in capsule, according to this Stanculeanu-Török-Elschnig technique, *i.e.*, 52.4 per cent. The impression is different when we compare the percentage in the first 200 cases with that in the last 200 that we have done.

	Plus or Plus Minus	Minus and extracapsular
	Per cent.	Per cent.
First 200 cases (in early part of 1930).	92 or 46	108 or 54
Last 200 cases (in first quarter of 1932).	136 or 68	64 or 32

Note.—Elschnig's designation of the cataract results accepted more or less everywhere and which I have adopted here is as follows:—

When the lens is taken out in its entire capsule, it is marked '+' (Plus).

When the capsule ruptures during the passage, but the entire lens and capsule is removed, it is marked .. '+' (Plus, Minus).

When the capsule ruptures early and the operation is completed extracapsularly it is marked .. '-' (Minus).

A brief outline of the operative technique at the outset will not be out of place. An incision covering a little less than half the circumference of the cornea is made with a conjunctival flap. With or without an iridectomy, a blunt capsule forceps is introduced into the anterior chamber and the anterior capsule is grasped about midway between the anterior pole and the lower edge of the lens, with at the same time a counter-pressure externally on the lower limbus with the tip of a strabismus hook. A little forward pull of the forceps and slight backward pressure with the hook on the lower limbus break the inferior zonular fibres, and a slight circumferential or side to side movement of the forceps breaks the lateral fibres. By this manœuvre, the lower half of the lens is brought forward into the anterior chamber. The tip of the hook is now insinuated behind the lower border of the lens over the cornea, and more by upward pressure of the

hook from below than by actual pull with the forceps, the lens is delivered in its entire capsule, with its lower edge foremost and the upper zonular fibres breaking last. It should be noted that the bite on the capsule is not lost hold of till the lens is out, and that pressure of the hook is never on the vitreous when once the lower edge of the lens is luxated forward.

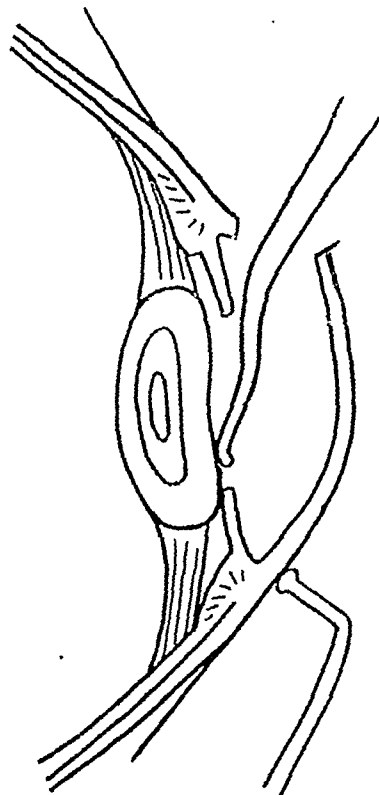


Fig. 1.—Shows the position of grasp of the capsule and counter-pressure.

This, in short, is the actual principle and I will now proceed to give the details and the explanations for each step. It is assumed that there is no contra-indication for an operation such as the existence of an infected lachrymal sac, glaucoma, etc.

Our preliminary treatment consists of sterilisation of the conjunctiva by brushing with 2 per cent. argentic nitras solution on the first day, application of 2 per cent. ung. hydrarg. oxid. flav. for two succeeding days and instillation of 1/5,000 hydrarg. cyanide on the evening prior to and on the morning of the day of operation.

Dilatation of the pupil before the operation depends on whether it is to be simple or combined. Two drops of 2 per cent. homatropin solution are instilled into the conjunctival sac the previous evening or on the morning of the operation, if the cataract is intended to be taken out with a round pupil. Otherwise, I do not see any necessity for mydriasis beyond what one gets with the cocaine and adrenalin instillations and the retrobulbar injection of novocaine and adrenalin solution (to be described later). An undilated and well reacting iris slips back into position comparatively more easily when the lens is out, and the risk

of prolapse of the iris is definitely less. For similar reasons, we never use atropin, which paralyses the iris and increases the risk of its incarceration in the wound. *Ad maximum* dilatation is quite unnecessary.

Simple extraction should not be attempted in cases where the pupil is not dilated enough in proportion to the expected size of the cataract. I had three cases of rupture of the sphincter where the lens was too large for the pupillary hole. Also, the capsule is likely to rupture if it is not strong enough to withstand the extra force of traction.

The preparation for the operation and the preliminaries on the table are the same as for the other standard operations.

We do not attempt any cataract operation without a peripalpebral injection of novocaine and adrenalin solution to paralyse the squeezing muscles of the eye (modified Van Lint technique) and a control suture on the tendon of the rectus superior (McReynolds'). How these give an added feeling of security is explained in my paper on 'Prevention of Infection in Cataract Operations', published in the *Indian Medical Gazette* of November 1927.

A solution of 4 per cent. cocaine with a few drops of adrenalin in it is used for anaesthesia. In addition, we give free instillations of 1/1,000 adrenalin solution, which help to keep the field anæmic. A bleeding flap is a great handicap to a successful operation.

I prefer a routine retrobulbar injection of half a c.cm. of novocaine and adrenalin solution (novocaine 2 per cent., adrenalin 1 drop to each c.cm. of the solution) five to eight minutes before the actual incision. This gives a complete anaesthesia of the whole bulb, augments the mydriatic action of the other drugs and incidentally—what is equally important—reduces the intra-ocular tension by about 4 to 8 mm. Hg. Thus the eye is in a very favourable condition for an attempt at intracapsular extraction, especially by fresh hands.

The injection is given from outside the lower lid, midway between the external and inferior recti, the needle going along the side of the bulb to the posterior pole of the eye, where $\frac{1}{2}$ c.cm. of the novocaine and adrenalin solution is deposited. It is advisable to draw up the piston before the injection, to be sure that the needle is not on a blood vessel, but this accident is very rare. A very fine, rustless needle should always be used.

I keep the speculum in throughout the operation. A light speculum, which does not press on the bulb, is selected. The assistant holds the control suture on the superior rectus tendon with one hand and looks after the speculum with the other. His chief business is to raise the speculum up immediately after the lens is out in the capsule or whenever there is a bulging forward of the intra-ocular contents. The traction forward of the lids caused by the

raising up of the speculum produces a negative pressure inside the eye and a retraction back, of the vitreous.

It is not possible to be exact in the size of the incision. It must always depend upon the size of the lens to be delivered. It should never be less than two-fifths of the circumference of the cornea, but on the other hand to go beyond half is scarcely necessary. It is always better to have a larger than a smaller incision. Too small an incision is a frequent cause of rupture of the capsule at the exit. Our incision is always limbal with a conjunctival flap, and never corneal.

We prefer a complete iridectomy in the majority of our patients, as they are mostly unintelligent villagers. They are so restless and disobedient that it is a positive danger to give them a round pupil as a routine. To the intelligent and careful man who may require the best vision he could get, we perform a peripheral iridectomy. Despite the fact that one meets with shallow chambers and posterior synechiae more often in simple extractions, the ultimate visual and cosmetic results induce one to aim at a round pupil wherever it is indicated.

Elschnig gives a small meridional cut at the base of the iris. I doubt how far this iridotomy will serve its purpose and at the same time will be safe, especially with our Indian patients. A peripheral iridectomy is always preferable to this iridotomy.

To one who is new to the operation, a complete iridectomy is helpful in giving a good view of the field and a proper grasp of the capsule. In simple extractions, the peripheral iridectomy can be done either before or after the delivery of the lens. I prefer to do it before, as it is easier to grasp the iris and to take the exact size of the pinch we want. Moreover, should there be any prolapse of vitreous following the lens, further intra-ocular manipulation for the iridectomy is fraught with the danger of further escape of that fluid.

The blades of the capsule forceps should be blunt and not toothed. They should come into exact apposition and the bite should not cut any tissue. Stanculeanu's capsule forceps and Elschmig's special model are what we use now. Sinclair's are also good. I do not prefer the latter as they are clumsy and one does not exactly feel the pressure of the pinch and the force of the pull on the capsule. But each one has his own partiality.

If there be any blood in the anterior chamber, it should be gently massaged out—I do it with wet cotton swabs mounted on *kuchees*—to give a clear view of the field.

The position of the operator during the process of the extraction is a matter of personal convenience. Elschmig and others in Europe take their position by the side of the patient, whereas I stand at the head of the table, for the right as well as for the left eye.

It makes no difference again as to which hand should hold the forceps and which one the hook. Both the hands have an equal share in the manipulation. In Dr. Kugelberg's words, 'The right hand should know what the left doeth'.

The process proper of extraction.—With a strabismus hook ready in one hand, the operator with the other hand passes the capsule forceps into the anterior chamber with closed blades, opens them at the lower half of the lens to about 2 mm. breadth and grasps the capsule about midway between the centre and the lower border, while at the same time he exerts a counter-pressure on the lower limbus with the tip of the strabismus hook in the other hand, so that the lens is not subluxated backwards by the pressure of the forceps. If the pupil is not dilated, one has to go behind the iris for the grasp. A grasp too low down, say at six o'clock, does not offer any special advantage, but it may cause the early breaking of the upper fibres from the weight of the lens, and bring about the unhappy position shown in Fig. 4. On the other hand, a grasp higher up is a practical disadvantage, as one cannot pull forward the lower border of the lens to enable it to make the somersault. Besides, the capsule is liable to give way especially at the back, as a fold in the centre puts the whole membrane under a stretch.

To get a good bite of the capsule, it may be necessary to exert a gentle pressure on the lens, which may be strong enough to produce its dislocation behind, causing the vitreous to come in front. It is to guard against this accident that counter-pressure is necessary on the limbus with the hook. This pressure is given just after the opening of the blades of the forceps and before the grasp. A pressure earlier will cause the forceps to scratch against the Descemet's membrane and on the lens, and a late pressure scarcely serves its purpose.

The actual grasp is more a matter of touch than sight and the hold must be steady and firm, but never too tight lest the thin capsule membrane be lacerated. With increasing practice, one gradually learns the right amount of force necessary.

The bite being made sure of, a slight traction forwards—towards the cornea and not towards the wound—is made with the forceps, while the tip of the hook continues to exert a downward pressure on the limbus. This traction on either side breaks the lower zonular fibres. During this forward pull, a side to side movement is also made simultaneously—one gentle pull on either side is generally enough—to break the lateral fibres, and that they are broken is seen by the slipping forward into the anterior chamber of the lower half of the lens. The length of the side to side movement depends on the nature of the cataract. A cataract with a small nucleus and a loose capsule requires a

larger length of swing, whereas for one with a hard, large nucleus, a slight shake is enough. At any rate, the lateral movement need in no case go beyond 4 mm. This side to side movement is slightly circumferential as in drawing an arc, but a straight horizontal movement also will do. Remembering that the posterior surface of the lens is in close contact with the patellar fossa of the vitreous, the traction during the whole manœuvre should always be forward.

When once the lower edge of the lens is luxated forward into the pupil, the tip of the hook is insinuated behind its lower border (Fig. 2) and the lens is now pushed up very nearly as in the last stage of Smith's expression for Morgagnian cataracts, but without any

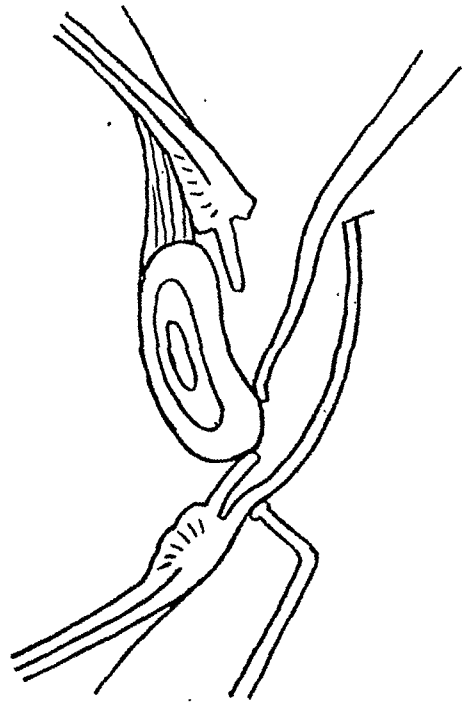


Fig. 2.—The lower border of the lens has just luxated forwards and the hook is insinuated behind it.

pressure at all, towards the vitreous (Fig. 3). With the forceps leading it, the push from below upwards by the hook makes the lens perform a semi-somersault and deliver through the wound with its lower edge foremost. The upper zonular fibres break last when most of the lens is out.

The moment the lens makes its exit, the speculum is raised and the control suture is relaxed so that there is no pressure whatever on the bulb. This traction forwards of the lids produces a hypotony and the cornea is frequently seen to collapse. This is a boon for a nervous operator and a fidgety patient.

The rest of the steps and toilet are as for the classical operation. Before the eye is bandaged, two drops of $\frac{1}{2}$ per cent. eserine solution are instilled. The miosis produced helps to keep back the vitreous in case it should have a tendency to bulge forward and also to pull down the iris away from the wound and

thus prevent any incarceration. The patient walks back to his bed.

The complications that one may come across during the operative procedure are chiefly the rupture of the capsule and vitreous prolapse.

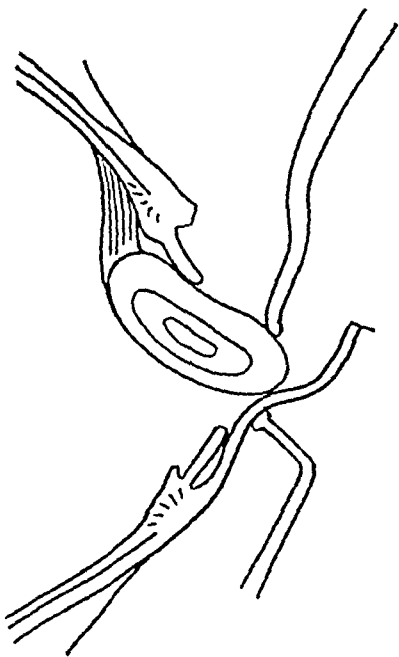


Fig. 3.—With the forceps leading, the lens is being pushed up by the hook. There is no pressure against the vitreous. The upper zonular fibres break last when the lens is just out.

The capsule may rupture at any time from the start to the finish. If it tears it is grasped immediately; it may happen in intumescent cataracts on account of the very thin nature of the capsule—the forceps is laid aside and the operation continued as an ordinary extracapsular operation.

The capsule may rupture at the posterior pole when a grasp is made in front. This happens if the capsule is tense; or, if the fold grasped is so wide that the capsule at the back is put under such a stretch as to give way; or, if the position of the grasp is nearer the centre than lower down on the front surface of the lens. In any case, there is not much harm done provided the operator is cool and collected. The whole capsule comes along with the forceps and the lens and soft cortex that remain inside are gently massaged out. But the whole manoeuvre must be very gentle as there is no protecting membrane against the onward protrusion of the vitreous. We have invariably been able to obtain a perfectly black pupil in these cases. It does not matter at all if some soft cortex be left behind, as it is absorbed more quickly than after an extracapsular operation. Irrigation of the anterior chamber is not advised.

If the capsule ruptures just when the lower edge of the lens is luxated forward into the

anterior chamber, the forceps is laid aside, the nucleus gently stroked back over the cornea into its old position and then expressed out along with the soft cortex, if any. Then, with a suture inserted over the wound (described later), the whole capsule is pulled out with an iris forceps. Traction during this procedure must be very gentle and careful. The suture in the wound guards against the gaping of the section and against vitreous loss in case the iris forceps should rupture the limiting membrane of that fluid during the attempt to pick the capsule.

Rupture of the capsule just at the exit is the worst thing that can happen. That may be due to an insufficient section, to undue traction, or to want of proper support and push from the hook. In the last case, the weight of the lens is too much for the capsule to bear and so it ruptures. Perhaps, with another grasp of the neighbouring capsule immediately, with the hook well supporting the lens, the process could be continued and the whole mass taken out in its entire capsule. In case this should fail, with the hook still supporting the lens, the nucleus can be hooked out with a cystitome or any instrument with a sharp point and the capsule pulled out immediately afterwards, or the whole mass can be taken out by expression alone. In all cases, especially in the last, vitreous loss is likely. Should all these attempts fail and the vitreous appear ahead of the nucleus, removal of the whole mass with the vectis is the last and only resort.

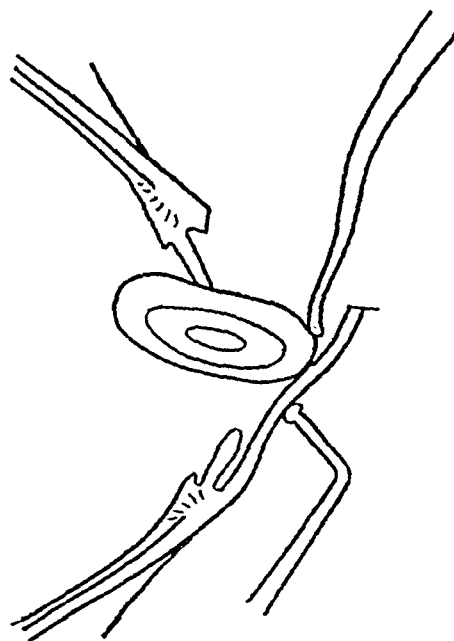


Fig. 4.—The bite being very low down, the weight of the lens has caused the early rupture of the upper fibres. It is dangerous to use the hook now. The lens has simply to be pulled out.

Apart from this cause, a vitreous loss can occur in cases of faulty technique, complicated cataracts, degenerated eyes, short tense eyelids

and in sensitive patients. (It is assumed of course that the intra-ocular tension is otherwise normal.) Slight loss of vitreous does not matter much. The visual result immediately after and later on is good. Only, the post-operative stay in the hospital in some cases is prolonged by a few days on account of ciliary irritation, but that is easily allayed by fomentations, and aspirin internally.

With increasing practice, one is able to reduce the percentage of vitreous loss to the minimum, especially in uncomplicated cases, as our experience with the first and last hundred of our cases, as given below, shows:—

	First 100 cases	Last 100 cases
Vitreous loss in uncomplicated cases.	6	1
Vitreous loss in complicated and uncomplicated cases combined.	12	4

In hypermature, dislocated lenses, one ought to be careful not to sublunate the lens further down during the grasp. The opposing pressure must be properly applied to prevent it. In these cases, the side to side movement is unnecessary. If the lens be flat, with a forward tilt of the handle of the forceps, the cataract may be taken out with its upper edge foremost, and the grasp then need not be very low down. In these cases, the vitreous is generally degenerated and is of a fluid nature. Loss of such fluid vitreous has no effect whatever on the healing, or the visual result.

Healing in normal cases is uneventful and the post-operative treatment is very slight. I dress the eyes every day. The pupil is kept dilated with atropin from the day after operation. This gives rest to the hyperæmic iris and prevents posterior adhesions on the vitreous especially in round pupil cases. The pupil is allowed to contract again after a week if the healing is normal. The eye is left open on the seventh day of operation, and usually on the fourteenth or fifteenth day, the patient is discharged, fit to travel by bus or bullock bandy to his home, which with our patients is generally a very long way off.

Among post-operative complications, hæmorrhage into the anterior chamber from the rupture of the wound is what we meet with very often. This has in no case been due to the operation, every hæmorrhage being traceable to an unwitting injury to the eye by the patient, e.g., his restlessness, cough, sneezing, etc. The blood clears up easily without treatment and it is absorbed more quickly than in extracapsular cases—only the pupil is kept well dilated. Evacuation of the anterior chamber, or absorbents internally such as potassium iodide are rarely necessary.

Instances of post-operative iritis are few and are far less common than after an extracapsular operation, as the eye is free from any cause

for irritation due to foreign protein let loose, and to capsular remains. No eye was lost by infection in the series under review, but there were three cases of iridocyclitis starting after the fourth day of operation. The exudate first appeared behind the iris, deep in the vitreous, and gradually got into the anterior chamber as a hypopyon. These cases showed a strong positive reaction for Kahn's test and responded well to anti-syphilitic treatment. Though it has ended in a closed pupil in all these cases, it is hoped to give the patients some sight, with an iridotomy, as the perception of light is quite good.

There were ten cases of incarceration of the iris in the wound, of which six were due to the carelessness of the patient.

In cases where a basal iridectomy or no iridectomy has been done, retraction of the upper base of the iris causing an elongated pupil has now and then been seen. This may be due to the ruptured zonular fibres becoming attached to the base of the iris and pulling it up. This seems to be of no significance whatever. We have not so far seen any late attack of secondary glaucoma in such cases. Eserin has practically very little effect in pulling the iris down.

I have not seen a single case in this series of choroidal hæmorrhage which is reported now and then by others, but we have often met with shallow anterior chambers, mostly due to supra-choroidal leaking, and it is met with more often in simple than in combined extractions. The large majority we have had are due to restlessness of the patient. In almost all cases, the chamber is re-established on the first or second day of operation, but it gets empty a few days later. If the patient is quiet, it reforms within a few days, and one need not be alarmed if it is persistently shallow, as it comes up sooner or later. In one case, it took 21 days to become re-established. The ultimate ill-effects are nil. But the patient is under some discomfort caused by contact of the sensitive iris with the posterior surface of the cornea. Eserin, dionin, aspirin and fomentation are indicated in persistent cases. The choroidal detachment that had occurred disappears immediately or a few days after the re-establishment of the chamber and the visual result is none the less good for the detachment.

With a limited experience of twenty-eight months, it is not possible to draw any definite conclusion as to the late results of this intracapsular operation, but I have so far seen two cases of secondary glaucoma. In one case, the operation was perfect and the healing uneventful, but the patient returned in six months with a raised tension and loss of sight. The other eye of this man, where intracapsular extraction has been also performed, is good still—a period of 18 months. In the other case, everything was all right except for a slight vitreous loss,

but the eye has gone on to blindness in eight months. The other eye has now been operated on extracapsularly with all precautions, but it is now showing signs of increased tension. The tension before operation was 20 mm. Hg. (Schitz), so there is not much evidence so far to blame the new operation itself as causing late glaucoma.

It is a matter for investigation to see what effect the constant contact of the aqueous has on the vitreous. Alfred Cowan, in the *American Journal of Ophthalmology* of February 1932, claims that the vitreous goes back to its position and that with the slit-lamp one can see a new lining membrane bounding its limits. I have been able to notice this lining membrane after about six months in cases where the vitreous is far behind the pupillary level, and also to observe a clear optically empty space between this membrane and the vitreous, corresponding to the retro-lental space. But this is found only where the vitreous is in its original position. It is not possible to corroborate Cowan's statement that the vitreous always receded back to its place, for I have seen hernias of the vitreous into the anterior chamber maintaining the same position even after a year. This in no way affected the integrity of the eye.

The fear that the intracapsular method is technically more difficult and risky should not stand in the way of an ordinary operator attempting it. The functional results attained justify such an attempt, and that there is no very high additional risk involved is evidenced by the following comparative statement of complications of our extracapsular extraction and the Stanculanu-Török-Elschnig operation.

	'St. T. E.' operation	Extracapsular operation
* Vitreous loss ..	5.2 per cent.	2.3 per cent.
Hæmorrhage ..	4.3 "	4.6 "
Shallow chamber ..	7.9 "	3.4 "
Iris prolapse ..	0.8 "	0.9 "
Post-operative irritation	0.9 "	1.4 "

* This includes complicated cases as well.

It should be remembered, however, that just as with any other intracapsular operation, this one also is not the operation for one who does a cataract for the first time. Experience in cataract operations in general is absolutely essential.

Age is an important factor in the success of an intracapsular operation. In India, it may be attempted with safety from the age of about fifty upwards. Young people have stronger and tougher zonular fibres and the capsule does not stand the strain of the pull necessary to break them. Patients of over 60 are of course the best suited, as the following table will show :—

	'+', '±', and Smith	'—', and extracapsular
Under 20 years of age	1	10
Between 20—30 "	7	32
" 30—40 "	51	103
" 40—50 "	186	203
" 50—60 "	484	335
Above 60 years of "	390	195

It must be borne in mind that all cataracts are not uniformly suited for extraction with forceps. Intumescent cataracts with the soft cortex in the process of hydration have a thin, easily bursting capsule. In Morgagnian cataracts, it is impossible to get a grasp of the capsule because it slips, and even if it is seized, it tears off immediately. These cataracts come out well in capsule with the Smith method, but they yield equally good results extracapsularly also.

A cataract with a very big, hard nucleus such as the black cataract, is unsuitable for forceps extraction. The nucleus is so large and hard that there is very little space for a fold of the capsule to be taken hold of, and the capsule is so brittle that it may rupture at any time. The incisions for such cases have to exceed sometimes half the circumference of the cornea. Beginners especially should not attempt to take this lens out in its capsule.

Incipient and immature cataracts, including the posterior cortical cataracts, are eminently suited for a forceps extraction. Also, most of the hypermature ones, where the capsule is not calcareous and brittle, come out well. All mature cataracts other than the intumescent ones may be successfully tried.

The following table gives a classification of the cataracts attempted according to the Stanculanu-Török-Elschnig operation.

	'+'	'±'	'—'
Incipient and immature ..	294	27	53
Mature ..	374	53	98
Hypermature	172	42	43
Complicated	76	10	25
Total 'Smith' extractions	..	..	74
Extracapsular operations	..	..	659

It is often hard to say for certain whether a lens is going to come out smoothly in capsule, but experience goes a long way in giving the clue and the slit-lamp helps a lot. But, in large busy clinics, it is hardly possible to subject every case to a slit-lamp examination before an operation.

Cyclitic cataracts with or without posterior synechiæ come out easily in capsule. We believe the zonular fibres also are diseased and give way readily. Intracapsular extraction of the lens in trephined eyes also is easy.

Diabetes is no contra-indication for intracapsular extraction. On the other hand, it is this operation that is indicated in such cases, as the eye will be free from the lens and capsule remains, which are potential causes for post-operative irritation in extracapsular operations.

Tense, short, powerful lids give considerable anxiety during the operation. The slightest pressure of the lids on the eye makes the wound gape. There is not enough space for the traction forwards of the lids to produce the negative pressure inside. A perfect akinesia of the lids is indicated in such cases.

The use of stitches to close the wound is the subject of controversy. It is not favoured in most of the hospitals in India, but that most cases do well without it is no argument against it. The insertion of sutures takes time no doubt, but it is well worth the trouble. A proper apposition of the wound with sutures gives one a feeling of security in asthmatics, in obstreperous patients, and in cases of vomiting after the operation.

It is often said that a suture is a source of irritation, attracting mucus at the spot and thus predisposing to infection of the wound. We find with our preliminary treatment of the conjunctiva, that collection of mucus at the spot is very slight. We now use sterilised human hair as sutures—the hair of Indian women is quite good and strong, if it is not too soft or curly—and the irritation this causes is scarcely worth mentioning.

Each operator has his own way of putting in a suture. For a beginner, I would advise two sutures. One is first inserted at the nasal side of the flap just before the extraction, and left aside with a loose knot. Immediately after the lens is out, this suture is tied firmly and another one is put in at the temporal side of the flap and tied securely. The replacement of the iris is done afterwards (Fig. 5).

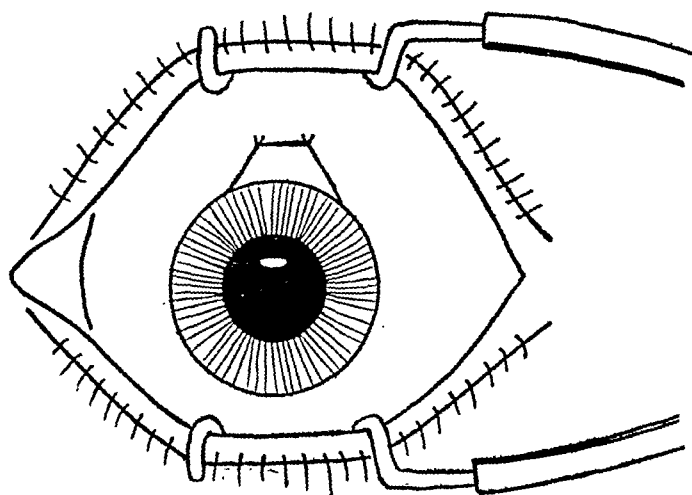


Fig. 5.—Shows the position of the two sutures in the wound.

The object of the first suture is to guard against vitreous prolapse. By tightening the knot immediately the lens is out, any protruding vitreous is pushed back. If the capsule be left behind, one can, with this suture tied firmly, safely insert an iris forceps to pull it out. The second suture is to get a proper apposition of the wound. More than two sutures can be put in should the wound gape much.

With increasing practice and experience as to how a case will turn out, one can give up the first suture. But, in cases where a vitreous prolapse is expected and where the patient is likely to be restless, the preliminary suture before the extraction is a great safeguard. For ordinary uncomplicated cases, I usually use a single stitch inserted immediately after the extraction. This is mainly to prevent a later under-riding of the flap by the margin of the upper lid, but it also minimises the risk of rupture of the wound in the conditions detailed above. The sutures can be taken out after the sixth day of operation, but they usually come out themselves before that date.

As the majority of our patients are illiterate, it has not been possible to estimate the refraction in every case. Wherever it was possible to make a test, it was found that vision in an uncomplicated case was never less than 6/12, with correction. There is usually a considerable degree of astigmatism of the cornea, caused especially by the stitch in the wound, and this takes about three to six months to become reduced. Patients with round pupils are naturally well able to do away with astigmatic corrections.

The technique of Stanculeanu-Török-Elschnig for intracapsular extraction is full of potentialities in this country, where the infinitely harder method of Smith has met with better results than in other countries. The relative safety of the operation and the wealth of material in this country will enable any surgeon of average experience to find that his results justify the routine adoption of intracapsular extraction for the majority of his cases of senile cataract.

Note.—For the convenience of readers a few of the more important papers on this subject are given below.

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THE PREVENTION OF HEART AFFECTIONS IN INDIA*

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EFFECTIVE methods of prevention of any disease must take into account its aetiology. Megaw (1910) said 'out of 37 rheumatic heart

* Being a paper read before the Medical Section of the Asiatic Society of Bengal on the 26th July, 1932.

cases 8 cases contracted the disease in the plains against 25 contracted in the hills of India and Europe; another interesting group of cardiac cases is that found in the epidemic dropsy type of beriberi' among Anglo-Indians and domiciled Europeans in India. Sir Leonard Rogers in 1925 held that syphilis was the main cause of valvular diseases seen in Calcutta, and that the factor of rheumatic infection entering into the ætiology of valvular diseases in Calcutta was negligible. The writer of this article in 1927 showed that in Calcutta acute endocarditis was a common event during the course of rheumatic fever, that cases of mitral disease considerably outnumbered the aortic cases, that myocardial affections—either primary as the result of focal infections, or secondary as the complication of various acute infectious diseases—constituted the bulk of heart affections of Bengal and that the majority of the people of Bengal between the ages of 20 and 40 suffered from degeneration of the myocardium independent of coronary sclerosis, due to anæmia and cachexia following many chronic infectious diseases, malnutrition owing to poverty, lack of physical education and debilitating climatic conditions which brought about the early death of her people at the average age of 20. In February 1930 Col. H. Stott stressed the importance of subacute rheumatic infection amongst Indian children being the great cause of mitral stenosis in young Indian adults and he quoted the evidence of Col. J. D. Sandes in support of his views. In the same year Col. T. A. Hughes and Dr. Mohammad Yusuf (1930) drew attention to the fact that rheumatism was an important cause of mitral stenosis in the Punjab. In October 1930 Col. R. N. Chopra and the writer of this article described the cardio-vascular changes in epidemic dropsy. In March 1931 Dr. J. Das Gupta reported on heart affections in Bengali babies in which congenital syphilis, endocarditis and malformation of the heart were present. In August 1931 Col. T. A. Hughes and Dr. Mohammad Yusuf pointed out the prevalence in the Punjab in middle age, of a degenerative type of non-valvular heart disease which was neither due to rheumatism nor to syphilis. In May 1932 Col. E. H. Vere Hodge stated 'current medical literature on diseases in the tropics or hot countries is, on the whole, silent on the subject of rheumatic infection though there seems to be ample evidence that the disease, as far as India is concerned, is by no means rare and is a potent, though not necessarily the most prominent of factors in the production of heart disease'. These are, to the knowledge of the writer the ætiological factors in the causation of diseases of the heart in India. Is it possible to prevent the occurrence of any of these factors? If not, is there any other way of tackling the problem? The more the author ponders over the subject the more is he convinced that there cannot be any other problem greater in magnitude and far-reaching

in consequence before the State, people and the profession than the one he has broached before this learned assembly at the moment. Indeed in March 1925 he emphasised its importance as the cause of premature death among Indians and said that it should be looked upon as one of the causes of national ruin.

Through the grace of God the two great causes of acquired valvular diseases of the heart—rheumatic fever and syphilis—are comparatively less common in this country than in Europe, the former due obviously to climatic conditions. Perhaps it may not be out of place here if I mention the findings up to date, of an enquiry that is being carried on regarding the incidence of syphilitic infection among the patients in my wards at the Calcutta Medical College Hospitals. Between October 1931 to December 1931, 62 patients were admitted into my wards in whom the routine Wassermann test was done. The results were strongly positive in 5 cases, moderately positive in 1 case, doubtful in 1 case and negative in 55 cases. Turning now to the great problem of these cardiac affections the writer thinks that the channel of entry of the infection present in any case, such as septic tonsils, appendix, dead teeth, etc., should be dealt with radically, which would lessen the risk of rheumatic infections. When rheumatic fever has definitely attacked the patient adequate doses of salicylates should be prescribed during the acute stage, and smaller doses of at least ten grains three times a day should be given regularly as a routine during convalescence, the patient remaining in bed *many weeks* while this treatment is continued. The actual length of time the patient is to be kept confined to bed should be judged by the pulse chart and not by the calendar. The possibilities of damage to the valves are greatly minimised by this method of treatment. Syphilitic infection should be vigorously treated in every case, this will reduce the chances of specific aortitis. Even when aortitis is actually present and anti-specific treatment has not previously been given, thorough treatment will save the heart and aorta from the inroads of syphilis.

As the principal cause of myocardial lesions in India is specific infections, well-planned attempts should be made to free this land from the ravages of various infectious diseases. It is a regrettable fact that millions of people die every year in India from infectious diseases which are wholly preventible. So long as this cannot be satisfactorily done, during the course of acute infectious diseases—notably diphtheria—very careful watch should be kept on the heart, and if there is the slightest indication of the development of carditis it should receive paramount attention from the physician, as such complications, if not immediately fatal, are the dawn of chronic heart disease which develops its full-fledged signs and symptoms and closes the chapter of life in later years. The necessity of

strict rest in bed for such patients for a prolonged period must be borne in mind, as it is the best of all cardiac tonics, and small doses of tincture of digitalis should be advised as it spares the heart to a great extent. The convalescence should be slow and carefully supervised. When there are focal infections every measures should be taken to eradicate them from the system. The aftermath of acute epidemic dropsy infection manifests itself annually with such a regularity that the cardiac attacks seen in such manifestations may be successfully averted by anticipating these yearly attacks in the rainy season and spending the period in a dry health resort with absolute rest in bed and a light nutritious diet.

Last but not the least of all, it is worth while to remember that, as with other infections, the question of soil is as important as the seed. Efforts should be made to divert the energies of young Bengal into the more profitable concerns of commerce and agriculture whereby they can earn a better living and consequently afford better food, instead of concentrating all their energies, as they do at the present day, upon passing the blood-sucking higher examinations which fail to remove their wants. Like the happy days of yore every prosperous Hindu family should keep cattle and own tanks in their own homes in the villages, whereby they can have cheap yet wholesome milk, and fresh fish which are absolutely essential for the nourishment of the heart muscle, for milk and fish are to the Hindus what meat is to the Europeans and Mohammedans. This would necessitate a 'back to village movement' which in itself will help to drive malaria out of the villages. The Mohammedans should likewise maintain poultry in their families in order to provide themselves with cheap meat and fresh eggs. The legislatures should enact laws making physical education compulsory whereby the heart muscle like the skeletal muscles will be well trained. By such social reforms it will be possible once again to build up a healthy myocardium, which will be a bulwark against the attacks of infections. If India cannot be freed from the scourges of infectious diseases all at once, it would yet be possible by the methods suggested above to develop a robust heart which will not fall an easy prey to infections. It is a well-known fact that the endocardium constitutes, anatomically, a very small portion of the heart and that the prognosis of endocarditis depends largely on the condition of the myocardium. If we cannot prevent heart disease, we can at any rate prevent heart failure, at least in some cases.

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A Mirror of Hospital Practice

CHANGES IN CARDIAC RHYTHM IN A CASE OF RHEUMATIC MITRAL DISEASE COMPLICATED WITH BRONCHO-PNEUMONIA

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THE following case of rheumatic mitral disease seems worthy of record on account of the changes in cardiac rhythm and in the electrocardiogram that took place over a short space of time following an acute infection.

T. R., aged 24, Hindu male, was admitted to hospital on January 16th with influenzal broncho-pneumonia. The disease was moderately severe but ended in complete resolution nine days after admission. It was most marked at the base of the left lung. The temperature was 101°F. throughout the illness, and the fall to normal took place gradually in three days. The patient stated that apart from the attack of influenza he had been suffering from breathlessness on exertion, cough with moderate expectoration and hæmoptysis for the previous 5 years. The hæmoptysis varied from blood streaks in the sputum to quantities up to eight ounces or so. In 1922 he had articular rheumatism for about a month, and five years later he had another attack of similar duration. The rheumatic fever was severe on each occasion. There was no history of syphilis and the Wassermann reaction was negative.

Examination revealed considerable enlargement of both sides of the heart. The apex-beat was diffuse and in the anterior axillary line, two and half inches below the nipple. There was a systolic thrill at the apex, and a fairly rough mitral systolic murmur, which was

conducted into the axilla. The second pulmonary sound was reduplicated. The liver extended three inches below the costal margin. There was no oedema. The blood pressure was 120/80. The pulse was regular, ranging from 100 to 125 per minute. On x-ray examination marked prominence of the conus arteriosus was seen. The electrocardiogram showed right-sided preponderance and almost complete absence of T_1 . The extrasystoles were found to originate in the left ventricle. On January 20th a distinct presystolic and a mid-diastolic murmur were heard just inside the apex.

The patient was given 10 minims of tincture of digitalis three times a day for 13 days after admission. Two days after the digitalis was stopped and 5 days after the pneumonia ended (*i.e.*, on January 30th), the heart rate suddenly dropped from about 100 to 50-60 per minute. The drop was found to be due to the complete omission of almost every second beat and the electrocardiogram showed an almost regular 2:1 heart-block. The P-R interval varied in duration up to 0.20 second. There was marked depression of the R-T segment in leads II and III and some elevation in lead I. The patient felt very weak. This state of affairs persisted until February 13th (14 days) when it was noticed that the pulse had become more rapid (about 75 per minute) and markedly irregular. Auricular fibrillation had set in. Electrocardiographic examination confirmed this, and revealed the fact that the R-T segment was now dislocated in lead III alone and only to a small extent. From February 13th onwards the pulse rate gradually increased until on the 29th it was 150 per minute. At this date digitalis was re-commenced and given in doses sufficient to maintain a pulse rate of 70 to 75 per minute. The patient left hospital in a fairly good condition on March 13th. The auricles were still fibrillating.

The above record shows that during the period of observation the patient developed three features indicative of myocardial injury, *viz.*, auricular fibrillation which apparently became permanent, temporary auriculo-ventricular block, and temporary dislocation of the R-T segment of the electrocardiogram. The first is of course very common in rheumatic mitral disease and its onset in this case was probably precipitated by the intercurrent acute infection, aided perhaps by the small doses of digitalis. The same factors were probably accountable for the block in the conducting tissue and the electrocardiographic changes. As, however, these features were temporary, the rheumatic condition must have played a smaller part in their production than it did in the case of the fibrillation. Dislocation of the R-T interval is most commonly associated with myocardial infarction but it has also been seen in acute rheumatic fever, in uræmia, and in pneumonia (Levine and Brown, 1929) and it can be produced by

anoxæmia, by alteration in the pH of the blood, and by digitalis (Gilechrist and Ritchie, 1930). There was no reason to suspect myocardial infarction in our case.

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A CASE OF SEVERE ENTERIC-LIKE FEVER DUE TO *BACILLUS ALKALIGENES*

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SEROY, S. S., was admitted to the Indian Military Hospital, Alipore, on 19th March, 1932, complaining of severe headache, pain all over the body, and fever which started without shivering.

Examination.—A well-nourished man, temperature—103°F.; pulse—100 per minute, regular, soft, markedly dirotic; abdomen soft, some tenderness in the right iliac fossa, superficial abdominal reflexes present; liver and spleen not palpable; bowels constipated; tongue coated with white fur; lungs—normal; heart—systolic murmur in pulmonary area; blood—no malarial parasites.

On 21st March, temperature—104°F., looking drowsy, tongue getting browner, pulse—110, still markedly dirotic; complains of severe headache and pain all over the body, especially in both loins, spleen not palpable; urine—specific gravity 1020, no albumin or sugar; blood—no malarial parasites; total white blood corpuscles—6,600 per c.mm., polymorphonuclears—73 per cent., lymphocytes—19 per cent., eosinophiles—5 per cent., mononuclears—3 per cent., culture—sterile. Motions—no cysts found, but a few ankylostome ova present.

On 22nd March, drowsiness quite marked, tongue brown and dry, temperature—103°F., pulse soft not dirotic, low muttering delirium at night, with picking at the bed clothes.

On 23rd March, condition the same, but temperature rapidly fell with sweating, drowsiness and delirium persisted. Tongue brown and dry; pain so severe as to warrant morphia.

On 24th March, temperature normal, but general condition the same.

On 25th March, temperature rose to 101°F., vomited bilious matter twice, pain still severe, especially in the loins, controlled by morphia, delirium at night.

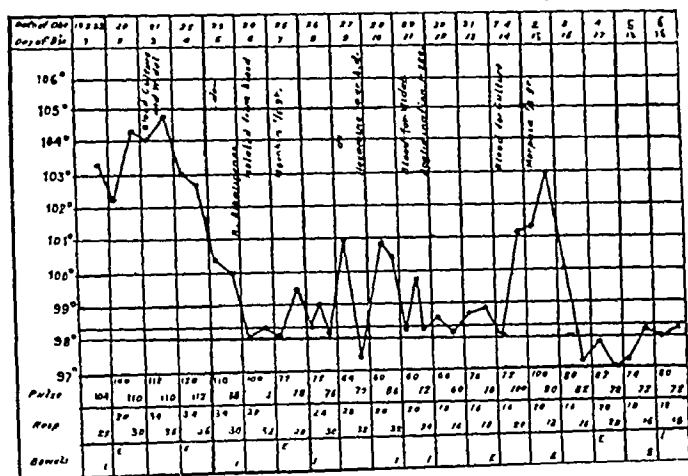
On 27th March, condition the same. Retention of urine relieved by catheter. Urine showed albumin and a few renal epithelial cells; the culture was sterile. Total leucocyte count was 5,600 per c.mm. Marris' atropine test was positive (pulse before injection—59, after injection—60).

On 28th and 29th March, temperature intermittent; little change in general condition; urine contains albumin and casts.

On 30th and 31st March, temperature normal though the general condition was bad; he passed urine and motions in bed, was restless and delirious.

On 1st April, temperature went up to 103°F., drowsiness increased; pain in the loins still present; abdomen very soft, no rigidity or tenderness, marked pulsation of aorta in the epigastrium; pulse again became dirotic and was relatively slow (100). Chest—diminished resonance and feeble breath sounds on the right side; no bronchial breathing or adventitious sounds. Heart—

systolic murmur at the apex. Ammonium chloride and hexamine administered.



On 2nd April, temperature—103°F, general condition same. Exploration of chest revealed no fluid. Urine—albumin less than before. Widal—agglutination 1—250 against *B. alkaligenes*.

On 3rd April, temperature came down by crisis with profuse sweating, drowsiness and pain rapidly disappeared, pulse very weak, brandy freely given.

On 4th April, marked change in the general condition, looked bright, eyes clear, temperature normal, no pain anywhere, felt very hungry. Urine—albumin still present.

On 5th April, convalescence commenced and further history uneventful except that the urine showed a trace of albumin until 10th April.

Points of interest in this case are:—

1. The clinical picture was very like enteric fever (headache, drowsiness, relatively slow dirotic pulse, etc.).

2. Though the temperature came down almost by crisis on the fifth day of the disease, the general condition continued to be bad with a typical typhoid state.

3. Presence of albumin in the urine from the eighth day.

4. Very severe pain in the loins relieved only by morphia.

5. Rarity of severe infections with *B. alkaligenes* which is usually a harmless inhabitant of the intestines.

My thanks are due to Lieut.-Col. R. de S. B. Herrick, I.M.S., for permission to publish the case, and to Major R. C. Wats, I.M.S., for the bacteriological examinations.

AN UNUSUAL CASE OF SPOROTRICHOSIS

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B. K. S., H. M., 38 years, came to the skin clinic with multiple subcutaneous nodules looking like boils, extending from the lower third of the right arm down to the wrist. The

nodules were of the size of a marble, 18 in number. These were distributed irregularly on the outer and posterior surfaces only, of the extremity. The body and other extremities were free. Two of the nodules were soft (suppurating) and the others were hard, red and painful (*vide* Fig. 1). He denied any history of injury, fever or syphilis. Duration of illness, 3 weeks.

The unilateral situation and irregular distribution appeared to be unlike that of common staphylococcal boils. There were neither any history nor any confirmatory signs nor symptoms of syphilis. The possibility of sporotrichosis was thought of but against that, there was no history nor any sign of injury and the nodules were not distributed along linear lymphatic channels as described in the textbooks; moreover, sporotrichosis is not common in India. Others were of the opinion that the case might be one of afebrile 'erythema nodosum' which is quite common in India. The case was then worked out according to the instructions of Colonel Acton.

In the meantime the patient was put on potassium iodide mixture.

The blood was examined for the Wassermann reaction and found negative. One hard and one soft nodule were incised and smears were prepared from inside the nodules. The smears stained with Leishman's stain showed small round deeply-stained bodies like 'yeasts' both inside and outside the polymorphonuclear and endothelial cells. These bodies might be mistaken for nuclear fragments.

Culture was also made on slopes of blood-agar, Sabouraud maltose peptone agar, and glucose broth. On about the tenth day the culture on slopes showed tiny colonies, cream coloured and radiating, and on the fourteenth day the growth in each tube was distinct, circular, gray and creamy in consistency, the central part raised and ending in a point, the peripheral part radiating. The culture in glucose broth was white with thick floccules at the bottom which floated on shaking. There was no contamination and the primary cultures in all the tubes were of the same nature. On examination mycelia, fine and septate, with small conidia given off directly from the hyphae were seen. True conidiophores were absent. Subcultures gave a rapid growth at first gray and creamy, which turned black in 3 to 4 days. A hanging drop culture was prepared and the microphotograph of a 48 hours' growth was taken (*vide* Fig. II). The mycelia were fine, about 2 to 3 microns wide and septate. Chlamydospores both terminal and intercalary were present. The conidia were given off in clusters or singly, directly from the hyphae towards the end or along the mycelia; true conidiophores being absent. The conidia were small, mostly oval (3 to 4 microns long and 2 to 3 microns wide), but some were round, with very short pedicles. Carbohydrates were not fermented (glucose, maltose, lactose, dulcitol, mannitol, dextrose, levulose saccharose, insulin, arabinose, salicin). The morphology together with the cultural characters and its actions on sugars were the same as *Sporotrichum beurmanni* (Matruchot and Ramond, 1905) var. *indicum* (Castellani, 1908).

The patient recovered with potassium iodide mixture without any local treatment.

The case is reported because sporotrichosis is not a common occurrence in India and this type of irregular distribution is not described in the textbooks.

PLATE I



Fig. 1.



Fig. 2.

owing to respiratory failure, the heart continuing to beat for some time after the respiration stops. Frogs were found to be least susceptible. Chopra and Chowhan (1932) have shown that viper venom unlike cobra venom has little or no action on protozoal organisms. These workers have further found (unpublished) that in experimental animals the blood pressure falls with a marked rise in the volume of the spleen and the intestines and engorgement of the splanchnic blood vessels; the heart dilates at first and then stops in diastole. Respiration becomes irregular and convulsions follow after some time. The lung volume and intratracheal respiration showed irregularity and later cessation, due to paralysis of the respiratory centre. This effect on the respiratory centre was further confirmed by Frank's method of isolating a strip of the diaphragm, which has connections only with the respiratory centre through the phrenic nerve. The effect of the venom appears to be like that of histamine. Saline infusions and adrenalin injections revive the animal by increasing the blood volume and constricting the systemic blood vessels.

The pharmacological action of the venom of *Echis carinata* is similar to that of the Indian daboia. It is marked by intense local inflammation, severe pain, and gangrene at the site of the bite. Hæmorrhages and sero-sanguinous effusions are found in all the serous cavities—pleura, pericardium and peritoneum. The blood pressure shows an enormous fall, the reflexes are reduced, and finally the heart becomes very feeble and stops in diastole. Death may take place by respiratory failure due to the central effect and pulmonary infarcts. If smaller quantities of the venom have been injected, the symptoms may slowly disappear after prolonged convalescence. The poison may leave behind permanent effects such as loss of sight, smell and hearing. The chief characteristics of the venom of *E. carinata* appear to be the production of local hæmorrhages, hæmolysis, wide dilatation of the vessels of the splanchnic area, and paralysis of the vasomotor and respiratory centres.

The amount of venom given at a single effective bite, as estimated by Acton and Knowles (1914), is 13.3 mgm. The fatal dose for man, on the average, is assumed to be 10 mgm., death occurring in a variable time. Provided that pulmonary embolism and asphyxia do not occur the chances of recovery in man are about 40 per cent.

Therapeutic uses of the venom.—Snake venom is called *Sarap visha* in Hindi and *Garala* in Sanskrit. The use of snake venom in Hindu medicine is of comparatively recent origin, as references to it are only met with in such modern works as Ratnavali, Sarkaumudi, etc. The Hindu practitioners obtain the poison by making the reptile bite a piece of wood, when

the poison flows out and it is collected on a plantain leaf. It is preserved by drying or by rubbing with a little mustard oil and spreading it on a plantain leaf. Although the venoms of other snakes are mentioned, it is chiefly the venom of the Indian cobra which is used.

Cobra venom forms the constituent of a number of preparations used by the Hindu physicians. Pills containing cobra venom are used in collapse, cholera, etc. With fresh juice of sugar-cane it is given in the treatment of ascites. It is said to be an irritant to the bowel, has a purgative action and is used as a hepatic stimulant. In the Mohammedan medicine the blood of a cobra is said to have a beneficial effect in leucoderma. A preparation containing arsenic and dead cobra is used for local application on leucodermic patches and syphilis in northern India. In some parts of Burma snake flesh is eaten as a food.

Rattlesnake venom has been used in Western medicine in a number of diseases of the most diverse character. It is said to have been employed beneficially in the treatment of pulmonary consumption, acute pneumonia, pulmonary gangrene, asthma, chronic spasmodic cough, hoarseness, neuralgia, chorea, epilepsy, hystero-epilepsy and hæmophilia. The use of the venom for respiratory and nervous affections has been discredited, but quite recently interest regarding its efficacy in epilepsy has been revived. Its use in therapeutics is based on its depressing properties on the nerve cells.

It is said that the pathological effects of any given venom on man vary with the dose injected. While large doses may be lethal, small doses may produce beneficial physiological effects. Observations have been made that people bitten by snakes become proof against epilepsy for years together. Spangler claimed that epilepsy can be cured by injections of snake venom, since a few epileptics in Texas were cured of the malady after rattlesnake bite. Viper venom (*Crotalinæ*) is said to depress the central nervous system. In the treatment of epilepsy, the venom is given in doses of 1/200 gr. by hypodermic injections, three to five injections being given at 8-day intervals, afterwards two more doses of 1/75 gr. are given at 14 days' interval. If the symptoms do not disappear, another dose of 1/25 gr. is recommended. It has been advised that during the treatment the administration of bromides should be discontinued. The dose and the interval of administration are to be varied according to the age of the patient and the nature of the injury. Fitzsimons (1929) pointed out that this method of treatment is not free from danger unless the venom is properly prepared by skilled hands.

Spangler (1925) used intramuscular injections of the protein of the venom of the rattlesnake (*crotalin*) which contains a peptone and a globulin for non-specific desensitization therapy

in allergic asthma. He took the degree of eosinophilia produced, as a guide to dosage and frequency of administration of the proteins. Usually the highest rise in the percentage of eosinophilia following venom protein injections in doses of 1/400 to 1/50 gr. occurs by the second or third day. Within 5 to 7 days after injection, the eosinophiles will usually have dropped to 4 per cent. or less, and then the patient may be given another injection. The strength of the dose is not increased if a given strength produces an increase of 8 to 10 per cent. of eosinophiles by the second or third day after an injection. By continuing the injections the rise of eosinophiles gradually becomes less, and finally does not exceed the normal limits. The patient is then non-specifically desensitized.

Cobra venom is also said to afford a means of diagnosing cancer—Farmachidis' test. This test depends upon the activation by cobra venom of the hæmolytic action of the serum in the complement deviation test, and it is asserted that the test is positive only with the serum of persons suffering from malignant disease. Injections of the venom of *Vipera aspis* are also said to protect animals against the fixed virus of rabies. Certain classes of people in India take small doses of snake venom habitually by the mouth with the idea that it protects them from the effects of poisons and diseases.

The therapeutic use of snake venom has recently showed signs of an increase. In India the belief regarding its stimulant action on the heart in small doses is very prevalent among the practitioners of indigenous medicine and it is used even by physicians practising Western medicine. There appears to be no justification for its use as a cardiac stimulant, especially when given by the mouth. Our experiments have shown that it is not absorbed from the gastro-intestinal tract, and even if there was some absorption, neither high nor low concentrations have any definite stimulant action on the cardio-vascular system. There also appears to be no rational basis for its use in the treatment of epilepsy, chorea, hæmophilia, asthma, etc., for which it is given by injection by the practitioners of Western medicine.

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THE PLACE OF PSYCHIATRY IN THE MEDICAL COLLEGES AND SCHOOLS IN INDIA

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As psychiatry is yearly earning a deeper significance in the theory and practice of medicine, I decided to circulate a questionnaire to the principals of all the medical colleges and schools in India to ascertain, if possible, what facilities exist for medical students in this country to acquire some knowledge of mental disorders. Replies were received from all the medical colleges and from all save two of the medical schools. The terms of the questionnaire were as follows:—

(1) How much time is devoted by the curriculum in your College School to the study of mental pathology and psychiatry?

(2) Who lectures to the students on this subject?

(3) What opportunities do the students of your College School get for clinical work in mental diseases?

(4) In the final examination how many questions are asked on mental pathology and psychiatry?

The replies to the questionnaire from the principals of the medical colleges are given in table I.

From table I it will be seen how greatly the status of psychological medicine varies in the medical colleges in this country. While the facilities for studying mental disorders seem to be the greatest at the Lahore Medical College, at the Osmania Medical College, Hyderabad, there are none at all. The subject is ignored. In the final examinations held at the medical colleges of Mysore, Patna and Calcutta, one question is regularly devoted to psychological medicine, but at all the other medical colleges

a question on psychological medicine depends on the discretion of the examiners.

Table II gives the replies received from the principals of medical schools in India.

TABLE I
Replies from medical colleges

Name of medical college	Time devoted for the study of psychiatry and mental pathology	Number of lectures given and by whom	Opportunities, if any, for clinical work	Number of questions on mental pathology and psychiatry in the final examination	REMARKS
1. S. G. S. Medical College, Bombay.	One term of 12 weeks of 12 to 15 lectures.	12 to 15 lectures are given by the Supdt. of N. M. Mental Hospital, Thana.	Lectures given in the Mental Hospital with demonstrations of different types of mental diseases.	One question is usually asked in the paper on general medicine.	
2. Medical College, Rangoon.	....	12 lectures annually by the Supdt., Tada-gale Mental Hospital.	Lectures given with illustrative cases of common types of insanity.	Generally none.	Remuneration Rs. 500.
3. Medical College, Lahore.	....	20 lectures and 10 clinics by the Medical Supdt. of Punjab Mental Hospital, Lahore.	Clinical work in mental diseases is afforded at the mental hospital.	Questions on this line are occasionally put at final examinations.	
4. Medical College, Mysore.	For a period of one month every year.	10 lectures and demonstrations on mental diseases given by Dr. F. Noronha, Supdt., Mental Hospital, Bangalore.	Clinical work done by students in Mental Hospital, Bangalore.	One question in the medicine paper for the final year examination.	
5. Medical College, Patna.	....	10 lectures and 10 demonstrations on mental diseases, by Major Dhunjibhoy, Supdt., Indian Medical Hospital, Kanke.	Students are sent to the Indian Mental Hospital, Kanke, for clinical training.	One question is set every year in the final examination.	
6. Osmania Medical College, Hyderabad.	....	No lectures given.	....	No questions set on psychiatry and mental pathology.	
7. K. G. Medical College, Lucknow.	For 10 days at Agra.	Lectures given by the Supdt. of Mental Hospital, Agra.	10 days at Agra and as cases arise in wards.	....
8. Lady Hardinge Medical College, Delhi.	Students go to Agra for 15 days' course.	Do.	They see cases either at the Out - patients' Dept. or at Agra.	No.	
9. Carmichael Medical College, Calcutta.	....	Students attend the Mental Observation Ward, Bhowanipore. 8 lectures are delivered by the Supdt. annually.	During lecture opportunities afforded for clinical study.	At the discretion of examiner. Number not fixed in the curriculum.	
10. Medical College, Vizagapatam.	12 tutorial lectures an hour each.	Supdt. of Vizagapatam Mental Hospital gives 12 lectures.	10 clinical lectures of 2 hours each, in the Mental Hospital.	Generally one question.	

TABLE I—concl'd.

Name of medical college	Time devoted for the study of psychiatry and mental pathology	Number of lectures given and by whom	Opportunities, if any, for clinical work	Number of questions on mental pathology and psychiatry in the final examination	REMARKS
11. Medical College, Madras.	For one month.	About 12 lectures by the Supdt. of Mental Hospital, Madras.	Students attend Mental Hospital for 3 months.	Nil.	
12. National Medical College, Bombay.	Not in the curriculum.	Nil.	Nil.	Nil.	
13. Grant Medical College, Bombay.	Students are required to attend not less than 10 lectures in the spring session.	Lectures are given by the Supdt. of N. M. Hospital, Thana.	Students attend lectures in psychiatry and mental pathology at the Mental Hospital, Thana, with demonstrations.	Generally one question in general medicine paper.	
14. Medical College, Calcutta.	....	A course of 8 lectures is delivered on mental diseases, including mental pathology and psychiatry, by the Supdt., Mental Observation Ward, Bhowanipore.	Mental cases in Mental Observation Ward, Bhowanipore, supplemented by 12 cases from the I. M. H., Ranchi.	One question.	

TABLE II

Replies from medical schools

Name of medical school	Time devoted for the study of psychiatry and mental pathology	Number of lectures given and by whom	Opportunities, if any, for clinical work.	Number of questions on mental pathology and psychiatry in the final examination	REMARKS
1. Government Medical School, Rangoon.	....	8 lectures annually by Supdt. of the Mental Hospital, Tada-gale.	Illustrative cases of common types of insanity shown on lecture days.	Generally none.	Remuneration Rs. 200.
2. Dacca Medical School, Dacca.	....	4 lectures by the teacher of Medical Jurisprudence and Hygiene.	Nil.	None.	
3. Medical School, Burdwan.	No provision in curriculum.	Last year two cases were taken up in the Outdoor Dept. by the teacher of Medical Jurisprudence.	Nil.	Do.	
4. Campbell Medical School and Hospital, Calcutta.	....	3 lectures given to senior students by the teacher of medicine.	Nil.	Do.	

TABLE II—contd

Name of medical school	Time devoted for the study of psychiatry and mental pathology	Number of lectures given and by whom	Opportunities, if any, for clinical work	Number of questions on mental pathology and psychiatry in the final examination	REMARKS
5. Jackson Medical School, Jalpaiguri.	Not in the syllabus	Nil.	Nil.	None.	
6. Medical School, Chittagong.	Do.	Nil.	Nil.	Do.	
7. Darbhanga Medical School, Darbhanga.	Do.	Nil.	A few passed students were sent to I. M. H., Kanke, for a fortnight.	Do.	
8. Orissa Medical School, Cuttack.	Do.	Nil.	Nil.	Do.	
9. Berry-White Medical School, Dibrugarh.	Do.	Nil.	Nil.	Do.	
10. B.J. Medical School, Poona.	....	10 lectures are given by the Supdt., Mental Hospital, Poona.	After lectures clinics are also held.	Occasionally one question.	
11. Medical School, Indore.	....	8 to 10 lectures are given.	A few cases from the general wards are shown.	One question.	
12. Missionary Medical School, Vellore.	Two weeks in a year.	For two weeks students are sent to Mental Hospital, Madras.	Nil.	One or two questions.	
13. Medical School, Agra.	....	6 lectures delivered by Supdt. of Agra Mental Hospital.	Lectures are held in the Mental Hospital.	One question.	
14. Medical School, Bangalore.	3 months at the end of 3rd year.	2 lectures and demonstrations a week by Supdt. of Mental Hospital.	Lectures are purely clinical.	Do.	
15. Medical School, Nagpur.	....	5 lectures by the Supdt., Mental Hospital.	Lectures are held in the Mental Hospital.	None.	
16. Medical School, Hyderabad, Sind.	....	10 lectures of an hour each by Supdt., Mental Hospital.	6 demonstrations are given to students, in Mental Hospital.	Hardly any.	
17. Royapuram Medical School.	....	8 lectures, one hour each by Dr. Parasuram, Diplomat in Psychiatry.	12 clinical demonstrations of 2 hours each in Mental Hospital, Madras.	Questions are asked.	
18. B.J. Medical School, Ahmedabad.	....	8 demonstrations are given at the local Mental Hospital by the Supdt.	....	Generally one question.	
19. Missionary Medical School for Women, Ludhiana.	....	10 lectures are proposed from next year.	Nil.	Nil.	

TABLE II—concl'd

Name of medical school.	Time devoted for the study of psychiatry and mental pathology	Number of lectures given and by whom	Opportunities, if any, for clinical work	Number of questions on mental pathology and psychiatry in the final examination	REMARKS
20. Medical School, Miraj.	During 3rd year lectures are given.	Once a week an hour is devoted for one year. By Dr. Frank.	Clinical opportunities are rather limited.	Separate paper is set for it.	
21. Women's Medical School, Agra.	....	6 lectures a year by Asst. Supdt., Mental Hospital, Agra.	Demonstrations at the Mental Hospital.	No special questions.	
22. Medical School, Amritsar.	....	10 lectures and demonstrations, by Supdt. of Mental Hospital, Lahore.	Students attend Mental Hospital, Lahore.	Number of questions left to the option of examiner.	
23. Lady Willingdon Medical School for Women, Madras.	Two hours daily for 15 days.	Supdt., Mental Hospital, Madras.	Out of 2 hours one hour for lecture and one hour for clinical demonstration.	One question. Sometimes nil.	
24. Lytton Medical School, Mymensingh.	Not required by the State Medical Faculty. Nil.	Not required by the State Medical Faculty. Nil.	Nil.	Nil.	
25. Bankura Medical School.	Nil.	Elementary lectures are given by teachers of Medical Jurisprudence.	Nil.	Nil.	

The same want of uniformity in regard to the instruction of students in psychological medicine seems to exist among the medical schools as among the medical colleges. In the curriculum of seven out of the twenty-five medical schools whose principals replied to the questionnaire, the subject of psychiatry is not included. In eleven of the schools no opportunities exist for any clinical work. As regards questions in the final examinations, it is somewhat surprising to find that at the medical school at Miraj a special paper is devoted to questions on mental disorders. In the examinations held at Indore, Vellore and Agra one question dealing with mental disorders is regularly set. At the medical schools at Rangoon, Poona, Royapuram, Ahmedabad, Amritsar and the Lady Willingdon Medical School for Women at Madras, the inclusion of a question on mental disorders seems optional with the examiners and is, generally speaking, a rare event.

From the foregoing data it is, I think, fair to conclude that there is considerable room for improvement in respect to the status of psychological medicine in the medical colleges and schools in India. First, the tendency to adhere to instruction in formal psychiatry still persists in India, so that probably far too much

of the limited time devoted to the teaching of mental disorders is dedicated to the psychoses and far too little to the neuroses and psychoneuroses. For this procedure there is doubtless the excuse that it is exceedingly difficult to give practical instruction in the psychoneuroses since so much of the examination of the patient must be done by the physician alone. Further, it is open to question whether the interests of the patient are not better served when no 'demonstration' of psychoneurotic conditions is made. Nevertheless, from the standpoint of the general practitioner this adherence to formal instruction in the etiology and differential diagnosis of the psychoses is objectionable, since there is no possible doubt that the general practitioner must deal more frequently with neuroses and psychoneuroses than with psychoses. But this is not all. Certain psychological material is basic to all medical teaching, so an acquaintance with the many features of normal and abnormal psychology becomes an ineluctable feature of all sound clinical teaching.

The unsatisfactory position of psychiatry in medical curricula is, of course, by no means confined to India. A special committee of the British Medical Council has recently published a report on this matter as it affects the teaching of medicine in Great Britain. This special

committee suggests that the following courses should be made compulsory for all medical undergraduates :

- (1) Lectures on normal and abnormal psychology, as a foundation for further study, comparable to that provided by physiology and pathology for general medicine and surgery;
- (2) Instruction in the psychoneuroses. For the general practitioner this is more important than instruction in the psychoses or in mental defect. The diagnosis of these latter conditions will clearly be his duty, and is of the greatest importance, but such cases will in most instances pass out of his hands for treatment. Psychoneurotic conditions, on the other hand, will often have to be treated by him;
- (3) Instruction in the psychoses;
- (4) Instruction in mental deficiency;
- (5) Opportunities for clinical experience in mental wards and out-patient clinics. Beds should be available in teaching hospitals for clinical instruction in certain psychoneuroses and early psychoses.

This course of instruction the authors of the report consider to be the 'minimum requisite for every undergraduate and should be made compulsory'. They base their opinion on the assumption that the future practitioner must expect to see in his daily work a great number of cases of mental disorders of all varieties and degrees of severity, including the psychoneuroses. They insist further, that a more frequent inclusion of questions on psychological medicine in final examinations is eminently desirable.

The first point made in this report, namely that some instruction in normal psychology should always precede instruction in abnormal psychology, is very important. As long ago as 1928 at the meeting of the British Association, Dr. William Brown, Wilde Reader of Psychology at the University of Oxford, presided over a special committee assembled to consider this point. The deliberations of this committee were guided by data obtained by means of a questionnaire that had been previously issued to all medical schools in the British Isles and the Dominions. It was reported that thirteen schools in the British Isles offered no facilities, eight had optional courses and five had compulsory ones. Most schools in the Dominions had courses, sometimes apparently of an extensive nature. Such instruction in normal psychology was placed, as a rule, in the pre-clinical or preliminary clinical years, a series of lectures being given with occasionally some experimental work. The majority of the opinions received in answer to the questionnaire, favoured the provision of optional instruction in this subject. The committee

reported, therefore, that, in its opinion, facilities should be available in every medical school for instruction in normal psychology in the pre-clinical years, preferably the second one. There should not be less than ten and not more than twenty lectures, and wherever possible about ten two-hour sessions in experimental psychology. The course should be compulsory and the instruction have special reference to medico-psychological problems; this would give a working basis for subsequent lectures in morbid psychology, which should be considered a necessary part of the general instruction in psychiatry.

Although it is unlikely at present that all the medical colleges and schools in India could arrange to include a course in normal psychology in their medical curricula, it is certain that a good many could do so if they could only be convinced of the necessity for this measure. For example, such a course could be arranged in Calcutta, Lahore, Lucknow and Mysore.

Next comes the question how much psychiatric knowledge should be required of a medical student to enable him to register as a medical practitioner. As things are at present it is obvious that in India practically no knowledge whatever is required. On the other hand, in some European countries a whole day is devoted to the examination of final year students in their knowledge of disorders of the mind. Those responsible for the training of future generations of Indian medical practitioners will have to reach some very definite conclusion on this point.

What is perhaps even more important for India at the present moment is the realisation that the country is lamentably devoid of competent psychiatrists, but with the introduction of an adequate training in psychiatry it is likely that a greater number of medical students would take an interest in the subject, to the end that this deficiency would gradually disappear. I would suggest that it might be well to put before the medical student in his first year an outline of the purpose of the course in psychiatry, while to second and third year students the opportunities of research in this branch of medicine should be made known. Mental hospitals should be encouraged to throw open their doors to students who have had two or more years in a medical school to enable them to gain first hand knowledge and experience as clinical clerks for a few months, for it is only by getting men actually in touch with the treatment of mental disorders before their medical careers have actually started, that we can hope to attract increasing numbers of men into the work.

At the present moment the idea of post-graduate study in psychological medicine does not exist in India in spite of the fact that it is the business of all medical colleges and schools to provide organised post-graduate work in

every department of medicine and public health, psychiatry included.

Now in so huge a country as India it may be very difficult for a medical practitioner to leave his practice, and spend a few months at a mental hospital studying new methods of diagnosis and treatment. Hence it seems that the adoption in this country of a procedure which is well known in America might be worth while. I refer to the system of allowing registered medical practitioners for a small annual subscription to have abstracts of cases presented at the staff conferences of hospitals, sent to them through the post. In this way new methods of examination and treatment are disseminated among practitioners in private practice as well as to other hospitals.

Not only the general practitioner, but, I maintain, the specialist in medicine, surgery and gynæcology as well, would benefit by paying more attention than they usually do to the problems of personality disorders, which arise in the practice of every physician and surgeon.

In support of this contention I will quote a passage from an article by Frankwood Williams which was published in the *American Journal of Psychiatry*. 'Recently', writes Dr. Williams, 'three young physicians have come to me to discuss problems of practice. Each is a graduate of one of the leading medical schools of the country, is practising in a large eastern city, and has been in practice some seven or eight years. Each said essentially the same thing: "Eighty per cent. of my practice consists of neuroses and most of the rest of it of common colds. I can do a little for the colds but what can I do for the neuroses?" "And what do you do?" "I give each patient as good a physical examination as I know how. When I am convinced that there is no physical basis for their complaints I do various things. Some I try to reassure, some to persuade, some I scold and treat brusquely, or I fiddle with their diets or hours of sleep and recreation and urge them not to worry". "And the result?" "They stay with me for a while; some get no better; and most of them sooner or later I cease to hear from". I suggested they should refer their patients to others who did understand the problems involved, but this was not acceptable because (1) there was no one available in whom they had sufficient confidence; (2) because if they did they would cease to make a living; the obvious suggestion was then made, "If neuroses form such a large part of your practice, then why not learn something about the neuroses?" That is exactly what they wanted to do and why they had come to me—to have me explain to them in a few minutes all about the neuroses and to tell them how to "read up" on the subject'.

Now there must be quite a number of general practitioners in India in more or less the same situation as that in which these three young

American doctors found themselves. As Dr. Williams observes in his paper from which I have just quoted, the medical student will profit more if, instead of beginning his course of instruction with the psychoses, or with a demonstration of pathological reactions exhibited by patients with psychoses, instruction is begun with the simpler emotional reactions. By means of such a course the student will get some idea of himself as well as of his patient with whom he has to deal. He may come to understand as he has never done before, his own emotional reactions, his own response to his patient and his patient's response to him.

As the author of that charming little book, *Pygmalion, or the Doctor of the Future*, says, 'Medicine in these latter days has neglected life too much. It has sought the living among the dead, or contented itself with the forms of things. The demand that human beings should be seen as something different from the animals, has often fallen on deaf ears. The doctor, in consequence, has become frequently something rather less than a man of culture..... The physician of the future will not, as is now usually assumed, be a "scientist" of the orthodox type, a man with the technique of laboratories at his finger ends, and with the aim in mind of elucidating the phenomena of life in terms of chemistry and physics. Rather, he will be a humanist, a man with the widest possible knowledge of human nature, and the deepest possible understanding of human motives. He will be a cultured man, ripe in intellectual attainments, but not lacking in emotional sympathy, a lover of the arts as well as a student of the sciences'.

The 'science of medicine', as Sir James Mackenzie called it, to distinguish it from other sciences, such as chemistry and physics, is the science of life, of humanity. The whole universe of knowledge, of emotion and of reaction is included in this tremendous ambit. There is nothing which man has ever thought or felt which cannot be used for his preservation or his healing—and which, therefore, does not concern his physician. By the term 'reaction' we may indicate the whole procession of life.

Current Topics

The Oral Treatment of Diabetes Mellitus : An Explanation of the Synthalin System

By A. T. TODD, M.B., M.R.C.P.

W. P. BRINCKMAN, M.B., M.R.C.S., L.R.C.P.
and

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(Abstracted from the *Practitioner*, May, 1932,
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INSULIN, a great advance in the treatment of diabetes mellitus, has many drawbacks in practice. Any system of treatment even approaching in value that of insulin, but not entailing injection, should be welcome.

It has been known for some time that guanidin markedly reduced the level of sugar in the blood. Frank investigated this action and by modifying the guanidin nucleus, he produced a compound which was devoid of the other toxic actions of guanidin. He called this compound synthalin, and claimed that it had properties similar to those of insulin, but that it was effective by oral administration. From 1927, synthalin has been continuously used in the Bristol Royal Infirmary diabetic clinic. Soon after its introduction, the Medical Research Council, wisely or not, forbade the sale of synthalin, pending investigation. Several centres, this clinic being one, were asked to test it and report upon the findings. With the exception of this centre, the reports were adverse; synthalin was condemned as not only useless, but actually dangerous. Since then few writers on the subject have failed to enlarge on the danger of synthalin medication. Yet on the Continent and in this clinic synthalin has been continuously and increasingly in use. It can now be said to be effective, if given correctly, and so devoid of danger that we have cases which have been on synthalin for four years, with excellent results. The system which follows is in no way a copy of Continental methods; a regime has been gradually perfected. Four years ago we could only treat about 25 per cent. of diabetics with synthalin; now we are able to treat about 70 per cent.

It may well be asked why this clinic was unique in finding synthalin useful; the reason is probably simple. At that time most English clinics were dieting diabetics on the system elaborated chiefly by Allen; this consisted in the minimum of carbohydrate and calories with gradual increase. This system was never in use at this clinic; from the time when insulin was introduced a diet relatively rich in carbohydrate and caloric enough to permit the usual work was given on diagnosis, and then insulin, later synthalin, was administered. If a diabetic is put on a diet poor in carbohydrate synthalin will be hurtful. Also synthalin is never given unguarded.

MODE OF ACTION OF SYNTHALIN

If we knew how insulin acted, we should be in a better position to understand synthalin. Frank claimed that synthalin acted like insulin, inasmuch as it reduced hyperglycæmia and enabled glucose to be utilized, as evidenced by the rise of the R. Q. and the drop in the arterio-venous glucose level, and his claims have been substantiated. It is not known how insulin and synthalin effect this.

Synthalin is most definitely a hepatic depressant; this is readily observed clinically and has been confirmed experimentally. The so-called toxic symptoms of synthalin are those of hepatic depression and are similar to the symptoms produced by other depressants; if injudiciously continued it will lead to jaundice and even liver atrophy. Synthalin, then, is regarded simply as depressing hepatic activity, more especially as regards glycogenolysis; with this increase of hepatic restraint due to synthalin, the endogenous insulin of the diabetic is adequate to enable carbohydrate utilization. This theory brings the action of synthalin and insulin into line, and is in harmony with our present knowledge. For insulin is an enzyme which causes glucose to be converted to a compound, probably glucosone, which can be utilized. Synthalin is not an enzyme and cannot alter glucose, yet glucose utilization is obvious when synthalin is correctly administered. It follows that synthalin must exert its action either by lowering the cellular threshold for glucose-insulin metabolism, or, more probably, it acts by depressing glycogenolysis, thereby increasing the secretion of endogenous insulin.

THE ADJUNCTS TO SYNTHALIN MEDICATION

Bile salts.—It was noted that synthalin is never given unguarded. Its introduction into therapeutics was shortly followed by papers which attributed the toxic symptoms to hepatic intoxication. Adler reported that urobilin increased and that jaundice might follow; he

concluded that this might be due largely to embarrassment of bile secretion, and advised that chologogues should be administered concurrently, and especially salts of de-hydrocholic acid. The advice was good, but was probably based on a faulty deduction, for Horning reported that the bile content of the gall-bladder was increased. Since then it has been learned that bile salts act, as Horning's observation would show, by stabilism, and also tend to

Pancreas.—As sweetbreads, or as extract, pancreas has had a vogue in the treatment of diabetes, and there could be little doubt from the work of Scott and others that it has some action. This belief was strengthened when Macleod reported that oral pancreas was necessary for the survival of completely depancreatized dogs. The patients are advised to take sweetbreads once or twice weekly.

Liver.—The action of liver is not so clear. Blotner and Murphy reported that liver diet has some action in depressing hyperglycæmia. Later observers have not substantiated this finding. However, since hepatic opotherapy has a place in the treatment of hepatic subfunction, especially cirrhosis, it may well be that liver, like bile salts, may have an action in restraining the depressant property of synthalin on other functions than that of glycogenolysis. Moreover, liver is quite a good form of protein. The patients are advised to replace the meat ration of one day each week with liver. The liver is given cooked, for cooking does not diminish its hæmatinic power.

Phosphates.—A negative phosphate balance is a feature of diabetes. When Meyerhof published his theory of the resynthesis of glycogen from glucose, such phosphate loss became more readily explicable; he postulated a hexose-phosphate stage. In diabetes glycogen is diminished or absent; resynthesis does not appear to occur, and phosphate would not be wanted. This stage in the synthesis of glycogen is not generally accepted, but even if it does not occur, phosphate loss would be expected in a wasting illness. A phosphate tonic mixture is given daily in order that abundant phosphate shall be available, and to act as a mild saline laxative.

Vitamin B.—Some favourable results of ingesting substances rich in this vitamin have been published. Its action in depressing glycæmia have not been substantiated, but it has been found that vitamin B appears to assist the absorption of glucose from the alimentary tract, and that it also tends to augment the amount of hepatic glycogen. As it also has a laxative action, it should be of use in the synthalin treatment.

THE REGIME OF SYNTHALIN TREATMENT

Diet.—The diet is calculated on the basal requirement of the patient, following Dreyer's well-known tables. Twice the basal amount is given for light, and thrice for medium-heavy work. Carbohydrate is allowed fairly liberally; the ration of fat to carbohydrate in grammes in the four stock diets is as follows:—

F/C : 107 : 180, 137 : 186, 165 : 220, 170 : 238.

Carbohydrate is given as bread, oatmeal, potato and other vegetables. The items of the various meals may be altered *ad libitum*, for there is no risk of hypoglycæmia. The patient is given beta-synthalin (Schering, London), decholin (Medical Laboratories, Ltd., (London), or one of the cheaper preparations of dehydrocholic acid (May and Baker, London).

Phosphate mixture: this consists of:—

R̄ Sod. acid. phosphat.	.. gr. xv.
Tinct. nucis vom.	.. ℥viii.
Spt. vini rect.	.. ℥xxv.
Inf. gent. co. ad	.. ʒi.

This mixture is taken t.d.s. For an adult patient start with 10 mgs. or two pellets of beta-synthalin, morning and evening after meals. With every two pellets of synthalin give one tablet of decholin. This is continued for two days, on the third day no synthalin is given, to prevent cumulation. The phosphate mixture is not stopped on the day of rest. The urine

should be tested daily for qualitative sugar, specific gravity and diacetic acid.

Synthalin is slow in action and probably no urinary change will be noted for ten days, but the patient often feels some relief before urine changes are noted. If there is euphoria but no urinary change, increase the synthalin by two pellets daily every five days or so, until either intolerance or diminution of the glycosuria and ketosis is observed. Even in the most satisfactory cases, traces of sugar will be noted in the urine every now and then. With each increase of two pellets of synthalin add one tablet of decholin. When good clinical and urinary results have been present for some weeks, it is well to attempt to diminish the synthalin by one pellet daily until the dose which stabilizes euphoria with a sugar-free urine is found. The bile salt preparation is diminished *pro rata*. Liver replaces the meat ration of one day. Sweetbreads replace half the meat ration of another day. A heaped dessert-spoon of bemax, or a teaspoonful of marmite is taken once daily. Blood-sugar curves are not essential, but are of use in the later stages, for as the curve approaches normality, the synthalin may be still further reduced.

Transfer from insulin to synthalin is usually easy in a case of slight or moderate severity, especially in elderly subjects. So long as insulin is being used the patient is allowed no liberty in altering the make-up of the meals preceded by insulin. For a 30 to 40 unit case, diminish the insulin by half, and institute synthalin as noted above. When urine is sugar-free, reduce insulin again by half, increasing the synthalin, if necessary. Thus gradually cut out insulin. There is little or no risk in transferring a patient backwards and forwards from insulin to synthalin in this manner.

Diabetic coma should not be treated with synthalin, as it is much too slow in becoming effective. Severe cases of diabetes, especially in young subjects, are better treated with insulin at first, but when stabilized a cautious attempt to wean on to synthalin may be made. As the clinician learns how to manage synthalin, he will find that he can successfully treat even severe cases in the stage of pre-coma. We have had several cases with high glycæmia, much ketosis and pronounced abdominal pain improve on synthalin; the dosage was more rapidly pushed up to 80 or 100 mgs. daily. Incipient gangrene should be treated with insulin until satisfactory progress warrants a trial of synthalin. We estimate that any practitioner will be able to treat 50 per cent. of his diabetics by this method at the outset, and that increasing experience will raise the percentage.

INTOLERANCE TO SYNTHALIN

It has been noted that intolerance will not often be found provided a high carbohydrate and a low fat diet is given. The symptoms are vague dyspepsia; feeling of weight in the upper abdomen; increase of flatulence and feeling of distension; either constipation, or more often variable constipation with colicky looseness; loss of appetite; loss of weight; general malaise and languor.

If such symptoms are experienced it is well first to try whether increase of carbohydrate and diminution of fat, and increase of bile salt does not give relief. A two-day rest period is worth trying. But if such symptoms persist and recur more markedly each time synthalin is restarted, it will be foolish to continue; transfer to insulin, but give synthalin a trial again later.

The Use of Calcium in Skin Diseases

By EDWARD PODOLSKY, M.D.

(Abstracted from the *Prescriber*, July, 1932, Vol. XXVI, p. 221)

AMONG the various remedies which have been tried in the treatment of skin disorders calcium occupies an important place. It has been known for some time that many cutaneous lesions are accompanied by a disturbance of calcium metabolism. The fundamental work on the relation of calcium to skin sensibility is that

of Klauder and Brown, who found that a high calcium and low potassium content in the skin meant lowered irritability, and vice versa. Subsequent investigations have confirmed these conclusions. Why calcium acts in skin lesions cannot always be determined accurately; but in the majority of cases its influence can be traced to one of its three well known basic properties: moderation of nerve excitability, lessening of cell permeability, and limitation of transudation phenomena.

The most remarkable action of calcium in skin diseases is the relief of itching. Karrenberg, who has used calcium gluconate intensively and extensively in dermatoses—in eczema principally, but also in lichen and dermatitis exfoliativa—insists on this point. Downing and Blumenfeld, who have applied calcium particularly to the treatment of pruritus (toxic dermatoses, neurogenic), have confirmed this.

Next comes the limitation of transudation. Karrenberg has found that calcium seems to be particularly indicated in acute exudative processes, and the more acute the condition the greater the action of calcium. He used calcium gluconate (known commercially as *Calcium-Sandoz*), a water-soluble salt which has the advantages of being suitable alike for intravenous and intramuscular injection and for intensive oral administration. Karrenberg insists on the necessity of high doses in order to get results. He seems to be partial to the intramuscular mode of administration. In acute cases, an intravenous injection of 10 c.cm. of 10 per cent. solution was given in the morning and the same amount intramuscularly in the evening. It has been found that in quite a few cases one injection of calcium gluconate brought about a subsidence of tension, burning, and itching. Local treatment, of course, also helps greatly. It is well to remember that in those cases in which calcium exerts a marked benefit, relief from disagreeable symptoms is accomplished when the calcium is utilized by the body in the shortest possible time, and the way to get calcium most quickly into the body is to inject it in the blood-stream. After relief from the itching has been obtained, intramuscular injections may be substituted. The treatment may be continued orally. The oral administration has also value by itself, particularly in the chronic state of eczema. Stokes summarized the main points of the so-called eczema problem when he advised this line of treatment. 'Use the x-ray sparingly, the quartz lamp often, autohæmotherapy oftener, calcium in large doses oftenest'.

In dermatitis herpetiformis with extensive patches and intense itching, calcium injected by the vein has caused the disappearance of the very bothersome itching, with gratifying relief to the patient. After relief of the itching, intramuscular injections may be substituted until the bullæ disappear. The treatment should be continued as a prophylactic measure for two weeks or so by daily administration of calcium gluconate in 60-grain doses three times a day. The same regime may be used in the treatment of lichen ruber planus. An intravenous injection will quite readily control the intense itching within an hour. Intramuscular injections may then be substituted until the itching has completely disappeared. One injection a day, given in the evening, is sufficient. The powder or tablet form of calcium gluconate may be given over a period of two or three months, and almost invariably very good results will be obtained.

In arspenamine dermatitis, calcium gluconate, used in the same way as in dermatitis herpetiformis, has given excellent results. Lichen ruber annularis may be attacked in a similar manner. Often after two intravenous injections the itching stops and the lesions become flat. Neurodermatitis also may be greatly benefited by calcium therapy.

Acne is believed by many dermatologists to be not merely a local disease but a systemic metabolic or endocrine disorder. For this reason calcium may be logically employed in this condition. Bloom has had considerable experience in treating this skin manifestation with calcium, obtaining marked improvement in

many of his cases, with disappearance of almost all papules in some, and diminution of the oiliness of the skin, and even the disappearance of comedones, in others.

Urticaria is a condition which usually yields to calcium medication. In conjunction with ephedrine sulphate in 3/8th grain doses four times a day this remedy has, in the hands of the writer, proved to be of great value in controlling the intense itching, when other methods failed. For quick results the intravenous or intramuscular injection may be employed, and the tablet or powder in 60-grain doses three times a day may be used orally.

In the great variety of skin inflammations produced by either internal or external irritants, such as dermatitis medicamentosa and dermatitis venenata, the itching which is such a troublesome symptom may promptly be relieved by an intramuscular injection of 10 c.cm. of a 10 per cent. solution of calcium gluconate.

Psoriasis is a skin disorder difficult to control. In many instances articular lesions are found to co-exist with the skin eruption. A neuropathic endocrine hypofunction may underline both skin and joint alterations. Calcium in the form of its gluconate has been found by Baer to be of great benefit in these cases. It is best to employ the drug intramuscularly, giving one 10 c.cm. ampoule every second or third day. After one or two injections, according to the experience of this investigator, the patches fade and the articular manifestations, effusion, pain and swelling recede. On the average five injections being all the symptoms under control. Calcium gluconate in powder or tablet form, 60 grains three times a day, is given after all the symptoms have subsided. By this means it may be possible in some cases to forestall a relapse. If the psoriasis recurs, as it often will, the treatment may be repeated.

The Use of Avertin in the Presence of Damaged Liver Function

By H. K. ASHWORTH, M.B., CH.B., M.R.C.S.

(Abstracted from the *British Medical Journal*, June 18th, 1932, p. 1123)

A STUDY of the literature reveals the fact that there are two conflicting views as to the deleterious effect of avertin on the liver. In his Lumsleian Lecture on toxic jaundice delivered in June, 1931, Sir W. Wilcox uttered a warning, based on theoretical pharmacological grounds, as to the possibility of liver damage by the use of avertin, and cited experimental work by Parsons on rabbits. Parsons himself is of the opinion that avertin is harmful to the liver, and has demonstrated slight fatty degeneration in rabbits after doses of 0.5 gram per kilo body weight.

These statements have been persistently challenged by Sir Francis Shipway, who bases his opposition on his extensive clinical experience with avertin, and in America, where the trend of experimental and clinical experience during the last two years has been towards freeing avertin from an undeserved stigma of toxicity. Thus Bourne, Bruger and Dreyer, after experimental and clinical observation on dogs and human beings, conclude that, relatively to chloroform or ether, the harm done by sodium amytal or avertin to the liver would seem to be negligible. As a result of their experiments on dogs Raginsky and Bourne have arrived at the following conclusions: (1) avertin has by no means the same damaging effect on liver as chloroform; (2) avertin can probably be used quite safely in individuals with moderate liver damage, although it is advisable to use smaller doses than usual to produce the desired effect.

Anæsthetists may have hesitated, owing to these conflicting views, to use avertin in cases of certain or suspected pre-operative liver damage, and cases are recorded in which avertin was used in the pre-operative presence of known or suspected liver damage, with no apparent harmful effects.

CONCLUSIONS

1. Conflicting views exist on the possibility of production of liver damage by administration of avertin. The weight of evidence suggests that such damage is slight or negligible.

2. The three cases described prove that avertin can be used without apparent harm in cases in which there is pre-operative liver damage, and also afford strong presumptive evidence that Bourne, Bruger, and Dreyer are correct in their conclusion that avertin is less damaging to the liver than chloroform and ether.

3. Avertin plus nitrous oxide and oxygen, with minimal ether if necessary, is a very suitable anæsthetic for gall-bladder surgery, even in the presence of liver damage.

Notes on Indian Scorpions

By REV. FATHER J. F. CAIUS, S.J., F.L.S.

and

K. S. MHASKAR, M.D., M.A., B.Sc., D.P.H., D.T.M. & H.

(Abstracted from the *Indian Medical Research Memoirs*, Memoir No. 24, June, 1932)

SUMMARY

(1) The scorpions more commonly met with in India belong to either genus *Buthus* or genus *Palamnæus*.

(2) Scorpions never sting unless disturbed, and on this count all accidents are due to *Buthus* or very exceptionally, to *Isometrus*.

(3) The amount of venom a scorpion can inject in any animal larger than its prey never exceeds a few drops.

(4) Scorpion sting is very rarely fatal; and thus scorpions are no more dangerous to human beings than bees or wasps.

(5) It not unfrequently happens that the glands are partly, if not entirely, empty; and, when full, there is a great difference between the quantities of venom contained in the individual glands of the same species.

(6) Different animals exhibit different degrees of resistance: the cold-blooded frog is more resistant than mammals; the dog, the rabbit, and the guinea-pig are more sensitive than the mouse or the bird; the wild Indian rabbit is three times more resistant than the pure bred English rabbit; the white rat and the white mouse are less resistant than the brown house rat.

(7) Whatever the experimental animal injected, *Palamnæus* venom is far less toxic than *Buthus* venom; and if dose for dose the time taken by the animal to die after the injection is reckoned as a measure of toxicity, this varies not only generically but also specifically.

(8) The venom of the young scorpion is much less toxic than that of the adult.

(9) The maximum amount of venom found by us in the glands of *Buthus tamulus* was 5.2 mg. If the toxicity of the venom in relation to body-weight was the same for man as for the very susceptible English rabbit, the total above quantity would not be lethal for a greater body-weight than 2.6 kilograms. Scorpion venom should then not be lethal to man, children not excepted.

(10) As a result of poisoning the nervous system becomes highly irritable; general excitability and the reflexes are increased; shivering, tremors, and muscular twitchings accompanied by disordered spasmodic movements are in evidence long before the appearance of paresis or paralysis of the individual muscles. The convulsions, when they occur, are very similar to those induced by strychnine. During the last stage of paralysis of the voluntary muscle the motor nerve endings are affected much in the same way as by curare. Through its local irritant action the venom stimulates the terminations of the sensory nerves and produces excessive pain and a burning sensation.

(11) After entering the circulation the venom acts on various centres in the bulb including the vaso-motor

centre. The centres of the facial nerves are stimulated: there follows excessive lachrymal, nasal, and salivary secretion. The effect on the vagus centre and spinal centre results in secretion of laryngeal and tracheal mucus, and also in constriction of the larynx and the pharynx. The action on the centres of the cord is evidenced by the manifestation of painful general spasms.

(12) The action on the nerve plexuses in the musculature of the intestine and the urinary bladder results in spasmodic contractions of those muscles; there is an increase in tone as well as in amplitude of rhythmical contractions. On the smooth muscle, the venom appears to act like the pilocarpine group by stimulating the nerve endings belonging to the parasympathetic system. The symptoms of vomiting and purging are thus accounted for.

(13) The venom stimulates the heart which continues to beat after failure of the respiratory centre, and finally stops in midsystole or complete systole. The stimulation of the heart and the rise of blood-pressure, which are both independent of the central or vagus control, are most marked with *Buthus* venoms. The vaso-constriction is of peripheral origin and contributes in part to the rise of blood-pressure.

(14) Death is entirely due to paralysis of the respiratory centre through the direct action of the venom, and is not dependent on the vagus centre or the vagal nerve or its endings.

(15) Scorpion venoms are very complex liquids which consist of the following active principles:—(1) Neurotoxins acting principally (a) on the respiratory centre and partly on (b) the vaso-motor centre, (c) on the nerve end-plates in striated muscle, (d) on plexuses in the unstriated muscle, and (e) on the responsive mechanism of the parasympathetic and the sympathetic in the secretory glands; (2) hæmolysins, agglutinins, hæmorrhagins, leucocytolysins, coagulants, ferments, lecithin, and cholesterolin; (3) a cardiac tonic; (4) a vascular tonic.

(16) The agglutinins present in the venom point to important generic differences; and the hæmolysins indicate specific variations.

(17) Scorpion venom closely resembles snake venom.

(18) The antivenom prepared at Kasauli against cobra and daboia venoms imparts a certain amount of protection to rabbits and dogs which have received lethal doses of the venoms of *Buthus tamulus* and *Palamnæus swammerdami*.

(19) None of the Indian plant remedies popularly used in the treatment of scorpion sting has been found to have any preventive, antidotal, or therapeutic effect.

Reviews

THE INDIVIDUALITY OF THE BLOOD IN BIOLOGY AND IN CLINICAL AND FORENSIC MEDICINE.—

By Professor Leone Lattes. Translated by L. W. H. Bertie, M.A., B.M., B.Ch. (Oxon.). Pp. 413, with 71 illustrations. Oxford University Press, London. Humphrey Milford, 1932.

PROFESSOR LATTES holds the remarkable record, surely very uncommon, of having published four editions of his standard work *The Individuality of the Blood* in four different languages. The first edition was published in Italian in 1923, the second in German in 1925, the third in French in 1929, and the fourth, with the aid of a translator, in English in 1932. All Professor Lattes' work is so important that each edition calls for careful study and extended notice, the more so as amazing strides are made every year in our knowledge of this subject.

While some aspects of serology have shown but little advance, except in matters of detail, during the last decade, an enormous mass of information has accumulated on the subject of the differences between different normal human bloods. A vast question has been opened

up thereby, the immensity and complexity of which is only now beginning to be realised. As a result, we are steadily advancing from the original four group scheme to the conception of an individual specificity for each human blood. When these differences are placed on a definite basis and suitable techniques are devised for their forensic application, the way of the transgressor will indeed be hard. Aside from this, the results will have a very important bearing on the problems of general biology.

A full account is given of the recently demonstrated M, N and P factors which appear to have no relation with the classical four groups. These newly discovered factors though present physiologically in the blood require an immune serum for their demonstration. It has been known for some time that some form of sensitisation to the blood of a particular donor may result from a first transfusion, the evidence being the occurrence of unpleasant symptoms after a second transfusion of the same recipient from the same donor. The author suggests as a probable explanation that after a first transfusion the recipient himself generates the necessary immune serum against these factors. Thus if the first donor is M +, the anti-M factor will be present in the blood of the recipient on the occasion of a second transfusion. The second donor should accordingly be M —. As this will entail complications in grouping, the practical point is that a cross test should never be omitted where a patient is receiving a transfusion other than the first. Thus, although the group of a person is believed never to change in terms of the classical four groups, this is not to say that unpleasant post-transfusion reactions may not occur where the same donor is used more than once for the same case, the reactions being due to sensitisation factors unconnected with the classical four groups. The author uses the important term 'acquired incompatibility' to describe these phenomena.

Professor Lattes gives instances to show that the group-specific properties of the body are not limited to the blood, but this aspect does not receive detailed consideration. The modified complement-fixation techniques very recently published by Schiff for the demonstration of group-specific properties in organs and secretions will no doubt find a place in the next edition. The author pays great attention to the forensic side. The hereditary relationships and their use in affiliation cases are fully detailed. The special group properties of bloodstains proved to be human are also discussed and their technical aspects fully described. He notes the importance of the Landsteiner-Richter reaction, which is entirely independent of any theory, which consists in testing the fresh corpuscles of the suspected persons with the blood of the stain. If a genuine positive agglutination is observed, this is sufficient to warrant the exclusion of the persons concerned. The Mendelian aspect of group heredity receives very full consideration, the observed frequency of the various groups being compared with their calculated probability on the triple allelomorph theory of Bernstein. This mathematical analysis has provided important evidence of the correctness of Bernstein's theory. A large amount of information on the ethno-anthropological aspects of the groups is given. A valuable bibliography, which stresses those papers which have contributed to the advancement of the subject, concludes the work.

This is a work of the very first class which should be in every medical library. It is more a work for specialists than for the general medical reader. Though not an easy subject, the Bench and Bar, particularly in England, will have to pay more attention in the future than they have in the past to the forensic implications of group tests.

It is perhaps superfluous to praise work from the pen of Professor Lattes. We may, however, congratulate the translator on having rendered it into extremely clear and agreeable English.

The get-up of the book is excellent. A few coloured plates would be an addition.

R. B. L.

BIOCHEMISTRY IN INTERNAL MEDICINE.—By Max Trumper, Ph.D., and Abraham Cantarow, M.D. London and Philadelphia: W. B. Saunders Company, Ltd., 1932. Pp. 454. Illustrated. Price, 27s. 6d.

DURING the last fifteen to twenty years biochemistry has made such rapid development and progress that it has now proved itself to be an important and powerful ally of clinical medicine, not only in the discovery of causes and cure of some of the important diseases, notably those of metabolism and nutrition, but also in the assessment of the prognosis in a given case. It also helps us considerably in the study of the functional efficiency of certain important organs and systems. The importance of the part it plays in the practice of medicine is therefore undisputed. The old conservatism, scepticism and ignorance about its practical value have gradually died out, giving place to a grateful acknowledgment of its usefulness and popularity even among the die-hard school of physicians.

The reason for this scepticism on the part of the physicians of the old school can be explained by the fact that the subject of biochemistry has always been of a highly complex and technical character and has largely been the province of the specialist. Recently however several laudable attempts at close co-operation between the internist and the biochemist have resulted in the production of a few very valuable books on clinical biochemistry and the present volume may certainly be regarded as one of them. The attempts of the authors in bridging the gulf between abstract biochemistry and clinical medicine deserve praise and the clear, concise, and simple style of dealing with a highly scientific and technical subject is admirable and makes the reading of the book easy and enjoyable.

The book is up-to-date and deals with recent developments in the science of biochemistry in its relation and application to clinical medicine. The medical practitioner, who has no time to read elaborate textbooks or monographs, will profit considerably by the perusal of this book and will find that many of his conceptions of biochemical changes in health and disease have undergone either radical changes or suffered considerable modifications. We have no hesitation in recommending Drs. Trumper and Cantarow's book to all who desire to be up to date in a clear understanding of the significance and limitations of laboratory investigations.

J. P. B.

DISEASES OF THE KIDNEY.—By W. G. Ball, F.R.C.S. (Eng.), and G. Evans, M.D. (Cantab.), F.R.C.P. (Lond.). London: J. & A. Churchill, 1932. Pp. viii plus 424, with 8 coloured plates and 159 text figures. Price, 36s.

THE kidney forms a particularly suitable meeting ground for the physician and the surgeon. The names of the two authors is a sufficient guarantee that the subject will be dealt with in a masterly manner and many of us who knew that this volume was in preparation have been awaiting impatiently for its appearance. Few, if any, will be disappointed. The book is all that a monograph should be, and the whole subject of abnormality and disease of the kidney is treated as completely—but not redundantly—as is possible.

To have divided the book into medical and surgical diseases would have defeated the whole object of the book, and this has not been done. There are two introductory chapters on development, anatomy, etc., and on the general signs and symptoms of kidney disease. There follows a chapter on the examination of a urinary case. This is a long chapter and in its way one of the most important in the book; it includes some excellent illustrations of pyelograms and radiograms. The next few chapters are short; these are on congenital defects, movable kidney, hydronephrosis, and injuries to the kidney. The chapter on Bright's disease is the *pièce de résistance* of the book. The old classification of the English school has been departed

from to a slight extent, but the most conservative could not object. Toxicæmic kidney is included under this heading, with apologies, also nephrosis but the two are already differentiated. Then come acute diffuse nephritis, chronic nephritis, chronic interstitial nephritis, and finally arterio-sclerotic kidney. There are two chapters on infection of the kidney and renal pelvis; these are divided into tuberculosis and non-tuberculosis. The three final chapters are in what must be considered as definitely the surgical side of the subject; they are on calculus, tumours and operations.

The printing, paper and binding are of the very high quality which we have been taught to expect from this well-known firm of publishers.

L. E. N.

STUDIES IN MALARIA AS IT AFFECTS INDIAN RAILWAYS. PART II.—By R. Senior White, F.R.S.E., F.E.S., and C. D. Newman, M.B., B.S., D.T.M. & H. Government of India, Central Publication Branch, Calcutta, 1932. Price, As. 14.

MALARIA CONTROL on railways presents problems which are peculiar to railways alone; thus anti-larval measures are only possible along a narrow strip of territory adjacent to the rails and the half-mile radius usually aimed at in control measures in India is not always possible, also new construction and bridge engineering present peculiar problems of their own. Accordingly, this small brochure by Mr. Senior White, Malariologist to the Bengal-Nagpur Railway, and Dr. Newman, District Medical Officer, Eastern Bengal Railway, deals with special railway problems which differ somewhat from those with which the malariologist is usually confronted. The book consists of three sections, a translation of a lecture by Dr. Azeglio Filippini on railways and malaria with special reference to the Italian State Railways, comments by both authors on the application of the principles of Dr. Filippini's lecture to Indian railway conditions, and an appendix by Mr. W. H. C. Kelland, Personal Assistant to the Chief Engineer, Bengal-Nagpur Railway, on malaria control on new constructions.

New railway construction in an endemic area nearly always means a virulent outbreak of malaria. The labour force collected at rail-head will almost always include gametocyte carriers, whilst the digging and levelling operations will open up new sites for anopheline breeding—especially by the creation of borrow pits. Instances are quoted from the construction of the railways in French Indo-China; in 1900 during the survey of the Liang-Biang section there occurred during eight months a mortality of 77 per cent. among the Europeans employed and 80 per cent. among the natives—chiefly due to malaria. In the Lower Namti region in Yunnan in 1905, of 5,000 coolies employed on the construction of the first 15½ miles of line there were 3,000 casualties—almost all due to malaria. In 1907 in a gang of 170 who had arrived a month and a half earlier there were 18 dead, 60 ill and 40 had bolted; in another gang of 150 there were 35 gravely ill, 50 hardly able to stand up, and 51 had run away. It is interesting to note that, under such circumstances, the French Government in Indo-China has decided to intensify the development of anti-malaria measures generally on account of the economies thus achieved and in spite of the existing world-wide financial crisis (Morin and Bordes, 1930, *Archives des Institute Pasteur d'Indochine*, No. 12, October, p. 84).

In addition to the creation of borrow pits, new railway construction often means the damming of natural drainage channels, imprisoning surface water, creating seepages, and thus increasing anopheline breeding. Finally, railways may passively carry infected anophelines from malarious to healthy localities; much of the malaria in Rome is attributed to this cause, and the Sergeant brothers have recorded the passive carriage of anophelines in trains for a distance of 191 miles in Algeria.

Among railway employees Dr. Filippini considers that the maintenance personnel who live on the railroad

are those most liable to infection, next come the running staff, whilst those least infected are the office staff. In the early days of railway construction in southern Italy, malaria was a terrible problem. Thus on the Southern, Calabrian and Sicilian lines 37 per cent. of the general sickness was due to malaria and a reserve of 108 per cent. of employees had to be entertained to replace men who had gone sick. On the Metaponto-Grassano line in 1880 malaria accounted for a sick rate of 208 per cent. per annum. On the Bicocca-Leonforte line in some places it was necessary to employ thrice the normal personnel during the fever season. On the 855 miles of the Adriatic System in the ten years 1881—1890 the cost of malaria was Rs. 629,520 annually, or Rs. 275 per mile per annum.

Turning to the measures now in force on the Italian State Railways the first requisite is the delimitation of the malarious zones. A schedule is then drawn up for each area containing the names of all employees and of their families containing details of the past and present malaria history of every individual. Every occupied building in the malarious zones is protected by metallic netting of mesh 156 to the square inch, chimneys being protected either by a net cap or a diaphragm in the shaft. Every building is officially inspected prior to each malaria season and the expenditure on new protection and repairs amounts to about Rs. 92,000 annually. Quinine administration to all employees and their families is entirely free and costs the State approximately 1½ lakhs a year. Anti-larval measures consist in bonification of land, drainage of borrow pits, oiling and Paris green. A very valuable measure is the employment of 'district doctors'; these are medical men living in the locality who, in return for free railway passes and the right to charge for medical attendance in diseases other than malaria, each take charge of some five miles of line or thirty-five families. They are provided with light quadricycles to run on the track and visit each family once in about every ten days distributing quinine for cure and prophylaxis. This system is very popular and some 1,700 such part-time 'district doctors' are employed; they send in reports regularly to the local health officers, who in turn report to the central health office.

Propaganda work consists in lectures and demonstrations given by the medical officers and in cinema displays. A special malaria allowance is given to employees and their families resident in highly malarious areas, and special pensions to employees invalidated from malaria.

Turning to statistical data, the introduction of protective measures in 1900 reduced the morbidity from malaria from percentages of 87 and upwards to 30 per cent. in 1903 and 6 per cent. in 1914. During the war, owing to difficulty in obtaining quinine, army demands for medical and other personnel, and repatriation of malarious soldiers from the Piave and Macedonia, the figure rose again and reached a percentage of 28.8 per cent. in 1919; since then however it has fallen again and was down to 18 per cent. in 1926. The case mortality is very low indeed—now only 0.04 per cent. In 1880 it was calculated that on an average each employee lost 4.5 days' work annually through malaria, in 1923 this figure had been reduced to 0.3 day annually, an enormous improvement.

In general, concludes Dr. Filippini, railways not infrequently cause an increase in malaria by creating conditions favourable to anopheline breeding and by aggregation of susceptible labour forces. On the other hand anti-malaria work is often more efficacious and effective on railways which possess a complete organization than in other industrial concerns. The railway staff is more cared for and more helped than other classes of labour and the general population. Thus in Italy while malaria in the railway personnel follows the fluctuations of the general epidemic curve, the morbidity figure is very far from that found in the surrounding population. 'The Italian Railways, which have experienced the grave dangers of malaria, can boast that they are in the forefront of the social struggle against it, and have created an organization which now, after

twenty years, is only in need of modifications of a general nature'.

In chapter III we have the authors' remarks on the application of the principles of Dr. Filippini's lecture to Indian railway conditions. 'Head-on construction', where the whole of the labour force live in mosquito-proofed trains that run forward as rail-head advances is only possible in certain very limited types of country. Thus it was used in the trans-Sahara railway, but is in general unsuitable for India. Even portable camps would not do away with the necessity for anti-larval measures. As things are at present, coolies erect thatched huts which afford ideal shelter for resting mosquitoes and which are very difficult to spray effectively with insecticides. For this reason the policy of having protected camps at short intervals along the line appears to be the only one feasible for Indian conditions. Even with a screened train on a head-on construction in hyperendemic country, it would probably be safer to run the train back every night into the protection of a larval-controlled zone.

With regard to malaria incidence, in India there are no figures available for those engaged on track maintenance since most of the gangs are villagers recruited locally and living in their own villages. Bridge and building men suffer severely since they tend to camp in river beds and other exceedingly malarious spots. On the Bengal-Nagpur Railway the medical department is always consulted before any bridge camp is established, with the most excellent results both from the health and the financial standpoints. It has thus been possible to let the contracts for the extra piers involved in the re-girding of the Bhanwar Tonk bridge at ordinary rates, though the locality is so malarious that during the original construction walking time was paid from Khodri, about six miles distant. This has resulted in a saving of some Rs. 70,000.

The authors differ completely from Dr. Filippini with regard to malaria among the running staff. Records for the Calcutta Medical District of the Eastern Bengal Railway, dealing with microscopically proved cases only, show that no less than 38.4 per cent. of the malaria morbidity occurred among the running staff. This is largely due to infections contracted in station offices and waiting rooms during halts at night. These rooms are not usually screened, and are sometimes not even provided with fans.

With regard to the transport of infected anophelines by trains, the authors quote some very interesting figures. In July 1931 a new breeding focus of *A. ludlowi* was discovered at Falta Point on the Hooghly below Calcutta. Two passenger rakes are stabled here nightly and arrive at Majerhat station each morning. During the last fortnight of August 1931 no less than 609 adult *A. ludlowi* were captured in these trains, of which 7 per cent. proved to be infected with malaria on dissection. Cases of malaria occurred shortly afterwards among the railway staff at Majerhat station and in the adjacent residential area of Alipore. In 1928 a number of cases of primary malaria occurred in what was considered a fully protected zone in Kuala Lumpur, F. M. S. Searches were carried out over a number of weeks and it was found that *A. maculatus* was being imported in the Penang mail train; from January to October 1931 the mail trains entering Kuala Lumpur from Penang and Singapore were systematically searched and 589 anophelines belonging to twelve different species were captured. The carriage of anophelines by trains conveying cattle must be even greater, and the transport of infected mosquitoes by trains (and aeroplanes) in the tropics is not a negligible factor in the local production of malaria. Sinton in four short railway trips in Siam in 1930 captured 7 anophelines belonging to five species.

Turning to delimitation of the malarious zones on railways, in India this has so far scarcely been attempted except on the new 268 miles construction of the Raipur-Parvatipuram section of the Bengal-Nagpur Railway. The children of station staffs are not a reliable guide to local spleen rates owing to constant transfers of

employees. 'Jungle allowance' to a station staff, however, usually means that the area is definitely malarious. The authors advocate the introduction of medical case-history sheets for all railway employees, on which the results of periodical blood and spleen examinations would be entered up. Further, the diagnosis of fever cases should be 'N. Y. D.' until malaria parasites are found in films; the sub-assistant surgeons can be relied upon to get 75 per cent. of positives in thick blood films from clinical cases of malaria. Malaria morbidity on the Eastern Bengal Railway for the years 1928-31 was three times the worst year recorded on the Italian State Railways, though the malaria incidence per 100 of staff fell from 31.5 per cent. in 1928-29 to 23.3 per cent. in 1930-31.

Screening of houses is practised far too little on Indian railways, whilst signal cabins are never screened at all. The costs of maintenance of screening are liable to be greatly exaggerated. Monel Metal or Grenite at £3 2s. 6d. per 100 square feet has a life of three years. With regard to quinine treatment the comparative figures are 46 grains per case on the Bengal-Nagpur Railway, 163 grains per case on the Eastern Bengal Railway, and 5,424 grains per case on the Italian State Railways. In India plasmodium deserves more trial than it has yet received for the control of gametocyte-carriers among children.

The basic control of malaria on Indian railways to-day, however, is by anti-larval measures, and in this connection fortunately the Indian anophelines can usually be dealt with by a half-mile control radius. In Europe *A. maculipennis* may require control measures over a radius of nearly two miles. In Italy the combination of screening and quininization with other measures, reduced the contact rate between gametocyte-carriers and mosquitoes to a minimum; in India, with screening hardly in practice at all, and a population with strong prejudice against quininization the generally high gametocyte rate ensures a considerable infection rate in the mosquitoes. In the Panama Canal zone the chief medical officer states in his report for 1929 that after twenty-five years of anti-larval measures he is still of opinion that it would be unsafe to cease screening bungalows. 'One should not be wedded, or limited, to one method of control alone'.

The separation of the curative and preventive sides of medicine, such as is in force on the Italian State Railways, has no parallel in India except in the case of the two railways who employ malarialogists. Considering malaria alone, and an average absence from duty of 8 days per attack, the Bengal-Nagpur Railway is losing more than seven lakhs of rupees annually, due to this one disease alone. If facts such as these were only properly placed before the administrations concerned by their medical departments, very much more might be done than is at present the case. In India propaganda work is still in its infancy, and much more use might be made for example of the cinema in travelling demonstration cars.

The authors come finally to a consideration of the further anti-malaria measures suggested by Dr. Filippini. Academic qualifications are not required for the microscopic diagnosis of malaria, and inexpensive laboratory assistants could easily be trained to work under a suitably qualified assistant or sub-assistant surgeon. Screening is a most valuable measure which has not received half the attention which it deserves in India. For screened running rooms there should be a chowkidar properly instructed by and responsible to the medical department. Adequate quininization is a *sine qua non* if the mass of chronic relapsing cases and gametocyte-carriers that swell the returns is to be properly sterilized. Something more palatable than quinine in solution must be provided. All railway schools should be inspected quarterly by the district medical officer, spleen and parasite rates should be regularly recorded, and all children found infected should be put under regular treatment for which the schoolmaster should be made responsible. A bonus might be given for a malaria-free certificate over a year's work.

Finally in India comes the possibility of combining in one individual the travelling sub-assistant surgeon and the malaria inspector. At present Indian medical subordinates do not take willingly to an outdoor life, but the medical field is now so crowded that it should be possible to obtain sufficient suitable young men. The malaria inspector should have a 'line-box' of medical equipment, and no more; much disablement of employees, and absence on trivial calls of dispensary medical staff would be avoided if the malaria inspector could deal with cuts and other minor injuries before they go septic, and dole out cough mixtures and cathartics as well as taking charge of quininization on his own length of line. A measure which also might well be introduced is that every railway employee on return from leave should report to the nearest medical officer for a certificate of fitness to return to duty, including a blood examination for malaria parasites.

The appendix to the report is by Mr. W. H. C. Kelland, Personal Assistant to the Chief Engineer, Bengal-Nagpur Railway, and deals with malaria control on railway constructions. This is an admirable essay dealing with the subject from the point of view of a highly qualified engineer, and full of interest as it presents the layman's point of view to the medical reader.

A MANUAL OF PHARMACOLOGY AND ITS APPLICATION TO THERAPEUTICS AND TOXICOLOGY.

—By T. Solimann, M.D. Fourth Edition. Thoroughly revised. Philadelphia and London: W. B. Saunders Company, 1932. Pp. 1237. Price, 37s. 6d.

'A MANUAL OF PHARMACOLOGY' by Professor Torald Solimann is already too well known to need any special introduction. Since its first appearance in 1917, the book has always been held in high esteem by teachers and students of medicine alike as a thoroughly reliable and comprehensive treatise to which they can always resort for information and references pertaining to the subject. Its popularity can be easily appreciated from the fact that within the short period of its career, it has been reprinted nine times and has passed through three editions.

The fourth edition under review, while retaining all the sterling qualities of its predecessors, has been further enriched by the addition of a large amount of new material embodying the recent developments in the domain of pharmacology and therapeutics. These additions have led to considerable revision and rearrangement of certain sections, the chief amongst which are the chapters dealing with vitamins, organo-therapeutic products, gold preparations, iodine compounds for röntgenological diagnosis, thallium compounds, synthetic antimalarial derivatives, etc. Those interested in the subject, who do not already possess a copy, will be well advised to procure one for their personal library.

R. N. C.

PROCEEDINGS OF THE ALL-INDIA OPHTHALMOLOGICAL SOCIETY, VOL. II, SESSION 1931.

Published by the All-India Ophthalmological Society, 161, Mount Road, Madras. Pp. xv plus 163.

THIS is the second volume of the All-India Ophthalmological Society and consists of twenty-six articles. These articles are all written by ophthalmologists working in India and comprise various subjects in connection with the eye. It is encouraging to see that this volume is considerably larger than the first and that the number of members of the Society has increased from 64 to 90. The article and discussion on cataract extraction by Dr. Ratnakar is interesting in showing that most ophthalmologists are in favour of the extracapsular extraction of cataract, and that the intracapsular extraction of cataract by the three different ways it is performed, is not as satisfactory and safe an operation as the extracapsular one. There are

altogether five articles on cataract. Few ophthalmologists will agree that simple extraction is the ideal operation and modern opinion is agreed that an iridectomy should always be carried out, as otherwise iris prolapse is much more common. The article on the treatment of glaucoma by Dr. Banaji is sound but the discussion revealed that opinions as regards operative treatment differ. Elliott's sclero-corneal trephining however, is the most popular operation for chronic simple glaucoma. This is the most common type of glaucoma in India and trephining is the routine operation carried out in the large eye hospitals in Calcutta and Madras. The article on the development, phases and contributions of Indian ophthalmology by Dr. C. N. Shroff is interesting and it is a pity that it is not more complete. Indian ophthalmology has contributed largely to our ophthalmic knowledge in the methods of the treatment of cataract and glaucoma. Most of the other articles are descriptions of interesting cases. Dr. Banaji in his presidential address pointed out the great need for the prevention of blindness in India, and it is hoped that the society will spare no effort to get organised an all-India Association for the prevention of blindness, with branches in the various provinces. This is what India so urgently needs to tackle the great problem of unnecessary blindness, which affects the economic welfare of her people.

We strongly recommend the second volume of the Proceedings of the All-India Ophthalmological Society to all ophthalmologists working in India.

E. O'G. K.

MATERIA MEDICA OF PHARMACEUTICAL COMBINATIONS AND SPECIALITIES.—By U. B. Narayanrao. Rayan Pharmacy, Girgaum, Bombay, 1932. Pp. xliii plus 249.

'MATERIA MEDICA of Pharmaceutical Combinations and Specialities' by Dr. U. B. Narayanrao of Bombay is a handy little book containing a descriptive list of over two thousand proprietary remedies and medicinal specialities in use by practitioners in India. The labour involved in collecting the information from many sources and in presenting them to the reader in a concise and readable form deserves commendation. There is little doubt that the publication will be largely appreciated in view of the modern tendencies of practitioners to resort to proprietaries and medicinal specialities.

While fully appreciating the utility of such a publication and the help it is likely to render to practitioners, the reviewer finds himself completely out of sympathy with the writer in his object of supplying the profession with a book of proprietary remedies for ready reference. The use of proprietary remedies and medicinal specialities has increased to such an extent, from the incessant canvassing and widespread advertisements of the commercial drug houses, that very seldom a prescription is found where a proprietary remedy has not been used. The publication of a manual of this nature would only serve to give impetus to this deplorable tendency. We must not forget that if the whole range of drugs in the pharmacopœia cannot cure a disease, the proprietaries certainly will not help matters. A proprietary remedy, if it is worth anything, would in course of time be sufficiently recognised to be included in the pharmacopœias and other official publications. The perpetuation of these remedies as a class by giving them a place in a book does not seem to be desirable.

R. N. C.

AN INTRODUCTION TO TROPICAL PATHOLOGY.—By T. Bhaskara Menon, M.D., M.R.C.P. Calcutta: Thacker's Press and Directories, Ltd., 1931. Pp. xvi plus 210, with 71 illustrations. Price, Rs. 10.

In this little book Dr. Bhaskara Menon has attempted with success to deal with the subject of tropical

pathology, in the novel way advocated by the world-renowned pathologist Dr. MacCallum of Johns Hopkins University. Instead of treating morbid anatomy as a subject by itself and rendering it uninteresting, the pathological processes underlying each disease are described in such a way that the reader not only gets a clear and complete picture of the morbid processes at work, but is also in a position to appreciate the important relationship that pathology bears to clinical medicine.

The subject-matter in the book, though elementary, is concise, clear and up to date and includes brief references to much recently accepted work. There are over seventy illustrations in the book and some of these are certainly good and instructive. Although the book is primarily intended for the use of the undergraduate medical student, the postgraduate and the general medical practitioner will also find valuable information in it. The book is therefore strongly recommended to all medical students and practitioners in the tropics.

K. V. K.

DISEASES AND DISORDERS OF THE DIGESTIVE ORGANS.—By Adolphe Abrahams, O.B.E., M.D. (Camb.), F.R.C.P. (Lond.). (Pocket Monographs on Practical Medicine). London: John Bale, Sons and Danielsson, Ltd., 1932. Pp. viii plus 92. Price, 2s. 6d.

THIS deals in a concise way with the subject of indigestion, dyspepsia, peptic ulcer and other stomach troubles. Colitis and dysentery have been excluded from the book. The monograph is useful for students preparing for the final examination in medicine.

S. P. B.

SURGICAL PATHOLOGY OF THE GENITO-URINARY ORGANS.—By A. E. Hertzler, M.D. (Hertzler's Monographs on Surgical Pathology). London: J. B. Lippincott Company, 1931. Pp. xvii plus 286, with 222 illustrations. Price, 21s. net. Obtainable from Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 15-12.

THIS book is one of a series of monographs by this author on surgical pathology. They are written for the average general surgeon and the pathology is looked at from a practical standpoint. This volume deals with the genito-urinary system but does not include cases of venereal disease, as these were not treated in Hertzler's clinic. The whole book is written in a racy, entertaining style quite unlike what one would expect in a textbook, but very attractive nevertheless. It almost enables one to class this pathology book as 'light' literature. The description of the condition of hypertrophied prostate is priceless. One gathers that in spite of the author's multitudinous other accomplishments, he is not a linguist, as all his references with about two exceptions are to books or papers in the English language.

A condition of 'induration of the penis' is described which is characterized by the development of dense keloid-like areas in the dorsum of the penis. Prognosis as to cure is bad and owing to the disability caused patients may become melancholic or even commit suicide. The author states that several of his patients with this condition ascribed their troubles to overwork!

In 'hydrocele' thick sacs and deposits of fibrin, only, are mentioned as a cause of non-translucency. Any surgeon who has done any work amongst dark-skinned patients will immediately also think of pigmentation of the skin as an additional cause.

In mentioning varicocele it is stated that the veins are 'soft compressible cords . . . which tend to lessen in the incumbent position'—an obvious misprint.

In dealing with the so-called 'essential hæmaturia', one agrees with the author that most cases represent some focalised hæmatogenous infection. The term has previously been used much too glibly as a cloak for ignorance in the same way as neurasthenia, influenza, and status lymphaticus are used.

One cannot but be struck by the author's sound common sense, especially in dealing with kidney tumours, and one feels that he is a seeker after truth, not content to follow the beaten track every time.

The book is well printed and easy to read, and contains numerous excellently reproduced photographs.

The series will be useful to the busy general surgeon wishing to revise his pathology and bring his knowledge up to date in a light-hearted manner.

J. F. C.

HANDBUCH DER CHEMOTHERAPIE.—By Dr. Viktor Fischl and Prof. Dr. Hans Schlossberger. Part I. Metal-free Compounds. Fischers Medizinische Buchhandlung, Leipzig, 1932. Pp. viii plus 357. Price, M. 34.

SOME excellent books have appeared on chemotherapy in the English language but none can be said to be as comprehensive as this German publication. The subject is of recent growth but it is connected with several branches of science and medicine. The authors, one a chemist and the other a medical man, have therefore combined their efforts to describe the present position of chemotherapy both from the chemical and medical points of view. They have tried to classify the subject-matter, to trace the historical relationship, to mention the synonyms of the plants concerned and the active principles isolated from them, and finally to avoid the errors that have crept into the literature during the past years. The discussion of the synthetic drugs, including the action of the newer drugs has also received the full attention of the authors.

As the title-page indicates, the present volume deals only with the metal-free organic compounds. It has been divided into 12 sections:—(1) Ayclic Chloro Compounds. (2) Unsaturated Fatty Acids. (3) Simple Benzene and Naphthalene Derivatives, Oxy- and Oxo-Compounds. (4) Amino Acids. (5) Quinoline Derivatives (excluding Quinine) and similar compounds. (6) Quinine and its Derivatives. (7) Emetine and its Derivatives. (8) The other Plant Products. (9) Acridine Derivatives. (10) The other Colouring Matters. (11) Colourless Urea Derivatives. (12) Human and Monkey Serum. The compounds under each section are discussed with regard to the history, chemistry, pharmacology and toxicity, therapeutic results and nature of action. There is a list of general literature at the beginning of the book and the detailed list of references at the end of each section together with important patent literature will prove very useful. The reader is rather inconvenienced by the want of a general index at the end of this volume, but the authors propose to do it at the end of the third volume which will complete this work.

These volumes will thus prove welcome additions to the existing books and will help to systematise our knowledge on this subject which is growing so rapidly.

S. G.

DISEASES OF THE CORONARY ARTERIES (MYOCARDITIS).—By Don. C. Sutton, M.S., M.D., and H. Lueth, Ph.D., M.D. St. Louis: The C. V. Mosby Company, 1932. Pp. 164. Illustrated. Price, \$5.00.

THE study of the diseases of the coronary arteries has, during recent years, occupied a prominent position in cardiology.

The authors of this small volume have made an intensive study of the literature and to this have added the experience gained as cardiac specialists in the Cook County Hospital. The result is excellent.

The first part of the book deals with symptomatology including that of myocarditis, angina pectoris and coronary thrombosis. The electrocardiographic findings are well described.

Chapters on anatomy, pathology and the physical examination of the arterio-sclerotic heart follow, and there is an excellent chapter on physiology and pharmacology which includes the action of the more commonly used drugs.

The last part of the book is devoted to treatment, and this, although quite short, contains all that is essential. There is complete bibliography and index.

Although this book does not contain any new theories or discoveries it is a very complete survey of our present ideas of coronary artery disease, and should be of value to all who are especially interested in this subject.

H. H.

SOME FACTORS IN THE LOCALIZATION OF DISEASE IN THE BODY.—By H. Burrows, C.B.E., F.R.C.S. London: Baillière, Tindall and Cox, 1932. Pp. xii plus 299, with 8 plates and 6 figures in the text. Price, 15s.

THIS book explains the reasons for the localization of disease to certain parts of the body. The author pays great attention to the increased permeability of the blood vessels in these regions to elucidate this phenomenon. He appealed to Sir D'Arcy Power for a name for this phenomenon and he suggested the word *diaporesis* which is derived from the Greek, meaning to drive through. The author then proceeds to show how the permeability of the endothelium has been altered under certain conditions. To study this he used certain dyes and found that they became localized in the areas of hyperemia produced by inflammation, and in the placenta during gestation. From this study he discusses the localization of the organisms of syphilis, tuberculosis, leprosy and other infective lesions. A part of the book deals with the localization of cancer and here the author shows that the development of the neoplasm may be due to some local concentration of a cancer-producing or cancer-favourable substance present in the blood, which accumulates under the influence of this local congestion.

The discovery of a pure synthetic substance such as 1 : 2 : 5 : 6 dibenzanthracene and some allied compounds which are carcinogenic marks a distinct advance. Such a view rather favours the theory of kataphylaxia where the local self-defence mechanism is destroyed and the new tumour cells can over-run their normal boundaries. The author rightly stresses the importance of Osterhaut's experiments on electrical conductivity and its relationship to permeability, whereby Osterhaut found that after a great alteration in conductivity the cell membrane remained more permeable than normal. This phenomenon is very frequently seen in such diseases as beriberi when the slightest amount of poisons in the diet causes oedema of the feet.

The subject of localization of disease depends on a very large number of factors, one of which is cell permeability, but selective activity of the reticular endothelium is as important or more important than permeability. The phenomenon of increased permeability becomes more apparent when the electrical charges at the cell surface are diminished by a fluid outside or by the activity of the cell inside.

This book should be read by people interested in research, as a number of ingenious experiments are given illustrating the author's views.

H. W. A.

Annual Report

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE. ANNUAL REPORT FOR THE YEAR, 1930-31

THIS annual report is always of interest to many of our readers in India. It consists of two parts; the report by the Dean on the work of the School for the year ended 31st July, 1931, and the seventh annual report to the Court of Governors. The year will always be marked in the records of the School by the tragic death of Sir Andrew Balfour, its first Director, on the

31st January, 1931. His name will always remain associated with the progress of tropical medicine in the first quarter of the present century. He has been succeeded as Dean (not Director) by Professor W. W. Jameson, M.A., M.D., F.R.C.P., D.P.H., Barrister-at-Law; we suppose that this involves the holding over of the post of Director for the time being, presumably for financial reasons.

A very important feature of the year was the formal recognition of the School as a School of the University of London in the Faculties of Medicine and of Science. In consequence of this, a series of University lectures were given at the School, and accommodation provided for university and other congresses and conferences. During the year 194 whole-time students were admitted to the various classes held in connection with the new Diploma of Bacteriology of the University of London, the D.P.H. of the London University, the D.P.H. of the Conjoint Colleges, the D.T.M. & H. of the Conjoint Colleges, and the Diploma of Psychology of the University of London. Of the 194 students 62 were from the Colonial Medical Services, 13 from Missions, and 2 from the I. M. S. India sent 34 and Ceylon no less than 15 of the students, but the bulk (107) came from the British Isles. In all 3,902 students have been admitted to the classes in tropical medicine and hygiene since the first foundation of the London School of Tropical Medicine in 1899; the effect of this innovation in medical policy in the British Empire may be seen throughout the medical research journals of the present century.

Very considerable progress was made during the year in the organisation and arrangement of the museum, under Dr. H. B. Newham, the Curator. The basement floor is devoted to sanitary engineering, and this section is now of great value in teaching. The top floor is devoted to tropical diseases, and here the malaria and blackwater fever sections have been completed and the whole collection is well advanced. The section dealing with parasitic worms has benefited greatly by a series of paintings from actual specimens by Miss Wilson. The second floor is devoted to public health. The library has now been expanded into an 'Intelligence Services' section, and a very important liason established between the School and the Bureau of Hygiene and Tropical Diseases. Lady Balfour has made a notable donation to the School in presenting to it Sir Andrew Balfour's wonderful collection of manuscript volumes of references to current literature on hygiene and tropical medicine from 1903 to 1930; everyone who is familiar with the work of the late Sir Andrew Balfour knows what a valuable collection these volumes provide. The bound volumes in the library now total 16,005, with 18,975 pamphlets and unbound volumes, and some 4,500 bound volumes and 13,000 pamphlets in the different departmental libraries. The whole is under the direction of Mr. C. C. Barnard.

The course of study in tropical medicine and hygiene was constantly under the consideration of the School Council during the year. The present five months' course virtually amounts to six months' leave for the candidates concerned, from the different colonial and imperial medical services. This is often inconvenient to the services concerned, and demands have been made for a shorter course. It has now been decided to divide the course of instruction into two parts, to be taken separately, viz, section A, a three months' course of clinical and laboratory instruction, and section B, a two months' course in tropical hygiene. The examinations follow closely upon the end of the corresponding course of study, the examinations for the School Certificate will be discontinued, and candidates will be encouraged to sit for the D.T.M. & H. (Eng.).

The main introductory part of the report is followed by reports from the different divisions and departments. Here we cannot do better than abstract from these reports as follows:—

Clinical tropical medicine.—Dr. Carmichael Low and Dr. Manson-Bahr in their reports say that the clinical teaching during the past session has been well maintained, and that cases of most of the tropical diseases

have been shown. In fact, during the year there have been available at the Hospital for Tropical Diseases more cases of tropical disease for teaching purposes than during any previous year of the Hospital's existence. There have been, for instance, large numbers of cases of dysentery, both of the amœbic and the bacillary variety, and an unusual number of cases of malaria of all three types. Cases of blackwater fever (two of which have arisen while the patients were in hospital in bed and under treatment for sub-tertian malaria), of sleeping sickness, and of kala-azar have also been shown.

It is unfortunate for teaching purposes that these rarer and more striking tropical diseases are becoming so few and far between. This deficiency is explained by the fact that the methods of treatment have been so much improved in recent years, and that all types of these illnesses occurring in Europeans are treated locally at their point of origin instead of being referred to London for treatment, as was formerly the case.

Reference has already been made to the extensive improvements carried out at the Hospital for Tropical Diseases; the medical staff and the students greatly appreciate these improvements, and, in particular, express their satisfaction with the Manson Clinical Theatre, where cases can now be shown to much better advantage, concurrently with demonstrations with the microscope and the epidiascope.

Department of entomology.—Dr. Buxton reports that through the kindness of numerous friends abroad, the material used in the elementary teaching is much more abundant than it was. Many species of insects which were formerly shown as demonstrations are now put in front of the individual students, and each student now receives on loan thirty-three slides and about thirty pinned specimens.

Dr. Buxton's report continues:

In my own research, I have continued to investigate the actual climatic conditions existing in the places where insects of medical importance live, and I am engaged in the analysis of the effects of temperature and humidity upon various ticks and bugs. It appears that the factors which influence the water balance of the insect are important in controlling the place in which it can live, its seasonal abundance, etc. My work along these lines has been extended by a grant from the Colonial Medical Research Committee, under which Mr. K. Mellanby, B.A., has been appointed, and is engaged on an analysis of the relations between lice and the climate which exists between the shirt and the body. This may lead to an understanding of seasonal changes in the numbers of lice, and the seasonal incidence of the diseases which are carried by these insects. A part of the above-mentioned grant is being used this year to meet the expenses of my own investigations in Palestine. I propose to undertake studies in micro-climatology.

Department of helminthology

Professor Leiper reports that Mr. J. J. C. Buckley, M.Sc., who completed his period of service as Milner Research Student and Demonstrator on May 1st, was appointed to the vacant post of Field Officer in the Institute of Agricultural Parasitology. In addition to assisting in the teaching, Mr. Buckley has examined throughout the year the helminth parasites collected from animals which had died in the London Zoological Gardens, and has shared in the identification of material forwarded direct to the Department by various correspondents in the tropics and elsewhere. He has published two papers dealing with new parasites, and a third describing attempts of self-infection with *Ascaris* from the pig by using a new method of approach. Mr. Buckley has brought additional support to the view that *Ascaris lumbricoides* of the pig is a distinct strain from that in man.

Miss P. A. Clapham, B.Sc., has continued, in part, observations on the bionomics of eelworms in sewage, begun by Dr. B. G. Peters, Ph.D., during his tenure in this Department of a Grocer Research Scholarship. She

has written two papers dealing with the responses of these cestodes to physical and chemical stimuli. She has also carried out a series of tests on certain new anthelmintics, and has shown experimentally that hexylresorcinol is a general vermicide of considerable potency.

During the past year attempts have been made to increase the number of intermediate hosts maintained in the aquarium, and through the skill and enterprise of Mr. Wm. MacDonald there seems every prospect that in the near future there will be available to advanced students opportunities for following some of the more important life-histories on living material.

Department of protozoology

Professor Thomson reports that Dr. J. Chandra Ray, who was a research student for over a year, working under a grant from the Indian Research Fund Association, has proceeded to India. Dr. Ray had devoted his whole time to researches on the cultivation of various species and strains of *Leishmania* on solid blood agar plates, and made an interesting series of observations on immunity.

Dr. Andrew Robertson, Lecturer in Protozoology, returned last year from a successful scientific expedition to Spanish Honduras, which was generously financed by the United Fruit Company. He made the interesting observation that the opossum harboured *Trypanosoma cruzi*, and he made a study of coccidiosis in calves. The results of these researches have been published. Since his return from Central America he has continued observations on *Trypanosoma cruzi* and coccidiosis in cattle and other animals.

With regard to his own researches, Professor Thomson says:

During the year I have devoted a considerable amount of time to the study of the morphology of the malarial parasites of man, and the results of these observations will be published in due course. I have continued researches on the cultivation and morphology of various leptomonad flagellates on plate cultures, on which a note has already been published. In collaboration with Mr. Norman Hall, researches have been carried out on coccidiosis and piroplasmiasis of sheep in Northern Nigeria.

Division of bacteriology

Professor Topley observes that the teaching work of the Division during the past year has been heavy, and will continue to be so in future. The new syllabus for the tropical course, while decreasing the number of hours spent in bacteriology during each course, will involve giving three courses during the year instead of two. The heaviest teaching work for the staff of this Division is in connection with the course for the University Diploma in Bacteriology, since this involves continuous teaching throughout the three academic terms, and makes considerable calls on the time of each member of the Divisional Staff. During the past year nine out of eleven students who took the course obtained the Diploma. One student gained distinction.

As regards research, Professor Topley has continued his studies in experimental epidemiology in collaboration with Professor Greenwood and with the assistance of Mrs. Joyce Wilson. The expenses of this investigation, including the salary of Mrs. Wilson, are defrayed by a grant from the Medical Research Council. The description by Miss Marchal, of the National Institute for Medical Research, of a natural virus disease of mice, has rendered it possible to study the epidemiology of this infection, and results of considerable interest have already been obtained.

The investigation into fluctuations in the nasopharyngeal flora of a sample of the normal population is being continued with the aid of a grant from the Ministry of Health. This work is being carried out by Mr. R. Lovell, under the general direction of Professor Topley and with the assistance of Miss E. A. Straker.

The recording of epidemic diseases in schools in connection with the work of the Committee established

by the Medical Research Council to enquire into this subject, to which a fuller reference is made in Professor Greenwood's report, is being carried out by Mrs. Joyce Wilson, who is acting as Secretary to the Committee, assisted by Miss E. A. Straker.

Professor Wilson has continued his experiments on the existence of transient fluctuations in the resistance of mice to infection with *Bact. aertrycke*, and is engaged on a study, planned to last three years, to ascertain whether these transient fluctuations are related to seasonal changes in meteorological conditions.

Br. abortus of the bovine type has been recovered from the blood of two further cases of undulant fever in this country, neither of whom had been abroad. Examination of the gaseous requirements of this organism has now been completed, and the results have been published. Work on the serological differentiation of members of the *Brucella* group is at present in progress.

Division of biochemistry and chemistry as applied to hygiene

This Division, of which Professor Raistrick is Director, comprises the Departments of Biochemistry and of Chemistry as Applied to Hygiene. The Department of Biochemistry was the latest to be developed in the School, and, although the fitting and equipment of the laboratories on the first floor had been completed during the academic year 1929-30, the equipment of the suite of rooms on the second floor, given over to Dr. Alexander Robertson and his associates, occupied the greater part of the academic year 1930-31.

The main work of the Division is research. Several of the workers in the Division, including Professor Raistrick, have continued the work initiated by him several years ago on the biochemistry of the lower fungi. The whole of this work appeared during the year in the Philosophical Transactions (Series B) of the Royal Society.

Dr. C. G. Anderson has been engaged on a study of the constitution of luteic acid, which is an unusual carbohydrate and a metabolic product of *Penicillium luteum* Zukal.

Dr. J. H. Birkinshaw and Professor Raistrick have been engaged in a study of new products of the metabolism of glucose by *Penicillium puberulum* Bainier and *Penicillium aurantio-virens* Biourge.

Dr. P. W. Clutterbuck has continued and extended the work commenced last year by Dr. H. G. Turley, who has now returned to America, on the metabolic products of *Penicillium chrysogenum* Thom. He has recently commenced, in collaboration with Mr. R. Lovell, of the Division of Bacteriology, a study of the unisolated material described by Dr. Fleming at St. Mary's Hospital, and named by him *Penicillin*. This mould product exhibits specific toxic properties towards certain species of bacteria, and it is hoped to isolate the material and work out its chemical constitution.

Dr. F. P. Coyne, who was appointed Research Assistant to Professor Raistrick by the Research Council of Imperial Chemical Industries, Limited, has investigated the production of mannitol from hexoses and pentoses by a white species of *Aspergillus*.

Mr. G. Smith, who was appointed Research Assistant to Professor Raistrick by the Department of Scientific and Industrial Research, has worked on the production of mycophenolic acid and of a new mould metabolic product, both of which arise from glucose as a result of the metabolism of species of *Penicillium* in the *Penicillium brevi-compactum* series. Mr. Smith and Mr. J. H. V. Charles have been responsible for the more purely micro-biological side of most of the work progressing in the Division.

The whole of the above work is mainly biochemical in nature. Work bearing on the organic chemistry side of biochemistry has been carried out under the direction of the Reader in Biochemistry, Dr. Alexander Robertson, and his students. When Dr. Robertson joined the staff of the Division of Biochemistry in August, 1930, he had in hand a number of researches carried over from the

East London College, and concerned chiefly with the chemistry of natural products. Hence it was Dr. Robertson's aim in the first place to complete this work as far as possible, and thus leave himself free to take an active interest in the organic chemical problems arising in the Division. The researches on lichen acids in which he has been interested for some time have been considerably extended with a view to correlating the properties of these compounds with those of the metabolic properties of moulds. The constitution of evernic acid, atranorin and barbatic acid have been conclusively established, and experiments on the constitutions of roccellic acid, erythrin, usnic acid and scopularic acid are in progress. A close similarity has been noted between the constitutions of usnic acid and those of the main constituents of the anthelmintic *Felix mas*. The detailed constitutions of the latter compounds are under investigation. An investigation is also in progress on an interesting nitrogen-containing compound first isolated from the mycelium of *Penicillium griseofulvum* Dierckx by Professor Raistrick and Mr. Anslow. This substance appears to be an entirely new type of organic compound.

Research is being carried out by Professor Delafield and his colleagues on chemical blood changes in infection, problems of sewage purification, problems of bacterial metabolism and preliminary work on oxidation-reduction.

Division of epidemiology and vital statistics

Professor Greenwood writes:

During the year under review there has been no diminution of the output of research work done in the Division. The quantity and, I think, the quality of the work in quantitative epidemiology and vital statistics have been maintained. Professor Topley, Dr. Joyce Wilson and I have reached another stage in the study of experimental epidemiology. We have provided a reasonably precise measure of the advantage to a herd of immunisation against what are probably fairly typical bacterial infections. We have shown that the advantage is considerable, but falls short of a solid immunity. On the other hand, precisely comparable studies of a virus disease have made it probable that here a really solid immunity is afforded by exposure to herd infection. This is a very important result; it is not unexpected, in the sense that the immunising effect of passing through an attack of such a disease as measles has long been known to differ from the effects of most bacterial infections. Its fundamental importance is in bringing within the field of precise measurement contrasting phenomena, knowledge of which is essential to full understanding of herd immunisation.

I have also given rather more attention than before to studies of a semi-historical kind in collaboration with Dr. May Smith, of the Department of Medical Industrial Psychology. At present much interest is taken in the study of minor mental and emotional disorders, and their importance is realised. It is sometimes forgotten that these matters occupied the attention of physicians in complex societies hundreds and even thousands of years ago. Changes in fashions of thought and language have prevented modern students of medicine and psychology from appreciating or even understanding the significance of older researches. We are attempting to make available some of this forgotten work, particularly that of Galen in the 2nd, and of Stahl in the 17th century. The time may come when persons adequately equipped, both from the standpoint of literary and scientific erudition, can be found to explore this fascinating field of research; for the present it can be no more than a paragon of those mainly occupied in other tasks. I have no doubt that the educational importance of this kind of work is considerable, and, having regard to the meagre resources for research and teaching in this field which the University at present has, it is probable that we shall have to take a still more active part in the future.

Public health division

The work of this Division has increased to such an extent that the Board decided to make Colonel Parkinson's office a whole-time one, and to appoint him Senior Lecturer and Assistant Director of the Division.

The number of special visitors to the School goes on increasing, and a large number of them find their way into the Public Health Division, especially those bearing letters of introduction from the League of Nations and the Rockefeller Foundation. Forty-five of those bearing such letters of introduction came here during the year, and the principal burden of making arrangements for each of them fell, in the circumstances, on Colonel Parkinson.

Note by Dr. Hamilton Fairley on research work at the hospital for tropical diseases

Research work has been continued in sprue and blackwater fever, and a new investigation undertaken in serological problems in filariasis. Our recent work at the Hospital for Tropical Diseases has shown that there is a definite biochemical background to sprue. Typically, this disease is characterised by a decreased or absent acidity in the gastric juice associated with high faecal fat which is adequately split. Blood analysis has revealed low blood calcium, normal or low values for inorganic phosphorus, and a low cholesterol content. Serum bilirubin may be increased, but never markedly so, and following the glucose tolerance test minimal rises in blood sugar occur. Haematological studies have shown the great frequency of megalocytic anaemia which responds specifically to liver extract therapy with reticulocytic response. More and more we are regarding sprue as a gastrointestinal disease, in which there is defective production in the stomach of Castle's bone marrow stimulating factor, associated with mal-absorption of glucose and fat in the small intestine. The enigma of the cause of the gastrointestinal derangement remains. In blackwater fever biochemical studies have shown the value of estimating blood urea and bilirubin in prognosis, and biochemical data are being used with increasing degrees of success in indicating the need for special lines of treatment.

In filariasis a new complement fixation reaction has been devised, using as antigen an alcoholic extract of *Dirofilaria immitis*, and a saline extract of the dried powdered worms has been employed with success in the intradermal test for *Filaria loa* and *Onchocerca volvulus*, as well as in *Filaria bancrofti*. These tests are group reactions, the complement fixation test indicating circulating antibody, and the skin test filarial antibody which has been locked up in the endothelial cells of the cutaneous vessels. Combined they supply information of the greatest value and afford a new approach to the study of filariasis.

MEDICAL INDUSTRIAL PSYCHOLOGY AND APPLIED PHYSIOLOGY

Extract from a paper on the work of the School read before the Royal Society of Arts on 22nd April, 1931, by Professor Greenwood

The results of Sir Leonard Hill's investigations are important enough, as everybody knows, but the spirit which quickened them is far more important. Long before he expressly directed his energies to the physiology of industry, of human life as a whole, he preached a new doctrine. For the first time a man who had done far more than win his spurs in what was regarded as the legitimate field of the academic physiologist came down into the workshop; refused to be roped off in a laboratory, and treated as an academic consultant, whose advice could be taken or ignored as the practical man pleased, determined to meet these practical men on equal terms, not disdaining to learn how life was actually lived.

Leonard Hill has been the real founder of applied physiology in England, and it is the business of such a school as that in Keppel Street to see that the liaison he established between the laboratory and the workshop shall never be broken. It is true that the number of

trained investigators is still small, but at least there are some, and, thanks to the co-ordination of our work with that of the Industrial Health Research Board, the number will increase. The organisation of the Medical Research Council has developed the co-operation of academic physiologists and the staffs of industrial organisations, so that joint work is possible in other branches of physiology than those with which Leonard Hill's name has been associated. In particular, the physiology of the special sense organs is now receiving adequate attention. A school such as ours, with its ample laboratory accommodation and its intimate relations with the public health and industrial medical services, is becoming a focal point, and upon our policy the future of applied physiology in England may largely depend. It is of happy augury that Sir David Munro, now a member of the Board of Management of the School, is Secretary of the Industrial Health Research Board.

While by 1918 applied physiology had already its Leonard Hill, psychology seemed either narrowly academic or a mere inferno of apparently very angry people shouting at one another. In the last thirteen years a great change has come over the scene. The Industrial Health Board realised from the beginning that the psychological aspects of industrial hygiene were in importance at least equal to the physiological aspects. The Board's reports on the causation of industrial accidents, on the ætiology of telegraphist's cramp, and, quite recently, on the nervous temperament, can leave no doubt of the value of what has already been done, and of the importance of what remains to be done.

We know that a great deal of the ill-health and worry which poison the happiness, and restrict the efficiency of a too large proportion of men and women in industry, is of psychological origin. We know that whether a person whose nervous make-up departs from the normal shall be able to lead a happy and efficient life is a question which can be answered, *not* with perfect confidence, but with fair accuracy, after skilled examination of the individual and his environment. A few years ago what was called psychology became a popular stunt. The nonsense of that period now hardly embarrasses real investigators. These have had to try to solve the following problem. Given that a great deal of inefficiency and ill-health are due to non-bodily causes, to 'nerves' or 'vapours', as one would have said in the eighteenth century: (1) Is it possible by clinical examination and laboratory testing to classify the 'nervous' types of the population at work; (2) Do the resultant classifications show substantial correlation with performance in or adaptation to actual industrial conditions. This problem has been so far solved that, as shown in recent reports of the Industrial Health Research Board, methods of examination have been perfected which enable us to correlate psychological type with effective performance.

The Industrial Health Research Board have devised a combination of clinical and experimental methods of research which is, I think, unique, and holds out hopes of advantages hard to exaggerate.

The part the School of Hygiene and Tropical Medicine is playing in this revolution is large. From the educational point of view we have to go further than was necessary in physiology. All medical students have at least received a training in laboratory physiology. No medical students have been trained at all in psychology of any kind, laboratory or clinical. A beginning was made last year at the School by introducing the elements of clinical psychology into the D.P.H. curriculum; but we have not been content with this modest instalment of reform. The Senate has been moved to establish a Chair of Medical Industrial Psychology in the School. The result is that the School is now able to take its fair share of the co-operation in psychological training, and the reproach is removed from the University that no teacher of professional rank is responsible for that kind of psychological instruction which is best fitted to give medical post-graduates an insight into a department

of research and prophylaxis which has been long neglected.

Correspondence

ATEBRIN IN MALARIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—With reference to the most interesting paper by Lieutenant-Colonel R. Knowles, I.M.S., and Dr. B. M. Das Gupta in the August issue of this journal, on 'Clinical Studies in Malaria by Cultural and Enumerative Methods. Second Series', I beg to refer to two points raised therein.

(i) *Plasmoquine* pure 0.01 gm. (1/6th gr.).—Tablets of the above strength were released for sale from June 1932. They are available in tubes of 15 tablets (Rs. 1-6-0), bottles of 500 (Rs. 39-8-0), tins of 10,000, 50,000 and 100,000. The above mentioned prices are subject to the usual discount.

Our manufacturers are very much obliged to Colonel Knowles for his kind suggestion to put this very convenient strength on the market, and we realise that the application of the now-a-days acknowledged small plasmoquine doses has been greatly facilitated thereby.

(ii) *Price of atebryn*.—We agree that the present list price of atebryn (bottles of 15 tablets: Rs. 3-4-0) is a serious obstacle to its wider use. It is perhaps not yet sufficiently known that the importers have to pay a 25 per cent. import duty on this preparation. We have approached the Central Board of Revenue in Simla to allow atebryn which, in spite of its recent introduction, is already of publicly acknowledged value in the treatment of malaria, to be passed free of duty. To such proposal, unfortunately, the authorities in Simla could not agree. We hope, however, that the above referred to paper, published from authoritative quarters, will induce the Central Board of Revenue to reconsider its decision, and thereby remove the handicap against the more liberal use of this drug which, it is expected, will play an important part in the campaign against what is economically the most important disease of British India.—Yours, etc.,

O. URCHS, M.D. (Prague),
Manager.

SCIENTIFIC DEPARTMENT,
HAVERO TRADING CO., LTD.,
CALCUTTA,
20th August, 1932.

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Will you kindly find space in the *Indian Medical Gazette* for us to report that we have recently tried without success to repeat our experience regarding the influence of Atebrin on the development of malarial plasmodia in the mosquito, reported in your April number of this year. Of 135 mosquitoes fed on a patient at varying times, some soon after the administration of Atebrin, 116 developed sporozoites. Green in the Federated Malay States, and we are permitted to say also Mr. B. C. Basu in Colonel Knowles' laboratory in the Calcutta School of Tropical Medicine, have obtained similar results. We are nevertheless investigating the matter further, in an attempt to elucidate under what conditions our previously reported observations may be repeated.—Yours, etc.,

C. STRICKLAND, M.A., M.D.,
Professor of Entomology,
and

D. N. ROY, M.B., D.T.M.,
Assistant Professor of Entomology.

SCHOOL OF TROPICAL MEDICINE,
CALCUTTA,
2nd September, 1932.

Service Notes

APPOINTMENTS AND TRANSFERS

In pursuance of the provisions of sub-rule (2) of rule 26 of the Council of State Electoral Rules, the Governor-General is pleased to nominate Major-General J. W. D. Megaw, C.I.E., K.H.P., being an official to be a member of the said Council of State.

The services of Lieutenant-Colonel N. M. Wilson, O.B.E., are placed at the disposal of the Chief Commissioner, Delhi, with effect from the afternoon of the 11th April, 1932, for appointment as Chief Medical Officer and Civil Surgeon, Delhi.

Major G. C. Maitra, an officer of the Medical Research Department, is confirmed in his appointment as Assistant Director, Central Research Institute, Kasauli, with effect from the 19th February, 1932.

The services of Major G. M. Moffat are placed temporarily at the disposal of the Government of Burma, with effect from 1st March, 1932, forenoon.

Major R. S. Aspinall is appointed to be Civil Surgeon, Simla East, with effect from the afternoon of 14th July, 1932.

The services of Captain W. J. L. Neal are placed temporarily at the disposal of the Government of Assam, with effect from the afternoon of the 22nd July, 1932.

To be Lieutenant (on probation)

J. D. Grant, M.B., 20th April, 1932.

PROMOTIONS

The promotion of Major H. M. Salamat-Ullah to the rank of Major is antedated to the 5th August, 1928.

The seniority of Lieutenant (on probation) S. Narain is antedated to 25th August, 1929.

The promotion of the undermentioned officers to the rank of Major is antedated to the dates noted against their names:—

Major R. L. Vance, 15th February, 1926.

Major B. S. Dhondy, 28th April, 1927.

Major G. D. Malhoutra, 16th October, 1930.

Major J. R. Katariya, I.M.S., vacated the officiating appointment of Executive Officer, Jhansi Cantonment. Dated 22nd May, 1932.

Lieutenant to be Captain

D. H. Waldron, M.B. Dated 6th August, 1932.

E. B. Eedle, M.B. Dated 27th August, 1932.

Lieutenant (on probn.) to be Captain (provl.) (on probn.)

K. Jilani, M.B. Dated 26th July, 1932.

RESIGNATION

The Governor-General is pleased to accept the resignation by Major-General J. W. D. Megaw, C.I.E., K.H.P., of his office of member of the Legislative Assembly.

RETIREMENT

The King has approved the retirement of Major-General H. Boulton, C.B., C.B.E., K.H.S.

LEAVE

Major H. E. Murray, officiating Surgeon Superintendent, Presidency General Hospital, Calcutta, is granted leave for the period from the 29th September, 1932, to the 25th March, 1933.

Captain R. Linton, Civil Surgeon, Chittagong, is allowed leave for 46 days, with effect from the 16th September, 1932.

Captain S. M. K. Mallick, a temporary officer of the Medical Research Department, is granted leave for

12 months, ex-India, with effect from the 15th November, 1932, or the subsequent date from which he avails himself of the leave.

Notes

'A CENTURY OF PROGRESS'

In no country in the world does the standard of pharmaceutical ethics reach a higher pitch than in Great Britain, and the big firms of manufacturing pharmaceutical chemists in Great Britain are well known the world over for the high standard of stability and reliability of their preparations. Medical ethics being what they are in Great Britain, it is not open to such firms to publish private reports by numerous doctors—as is done on the continent; they have to be content with published reports in the British medical journals, and the position is a perfectly sound one; it is merit alone that tells.

We have recently received a very interesting brochure dealing with 'a century of progress' published by Messrs. C. J. Hewlett & Son, Ltd., of London, and have very great pleasure in adding our congratulations to the firm to those of editors of other medical journals throughout the world.

Hewlett & Son was established in 1832 by Mr. Charles J. Hewlett, a charming portrait of whom is given in the frontispiece. Those were the days when an enterprising pharmaceutical chemist travelled the countryside in a horse and trap, gaining knowledge and business acumen. In 1838 he created an entirely new departure by issuing the first printed wholesale druggists' list. Under his direction the firm steadily expanded and finally came to occupy its present premises in Charlotte Street in 1890 under the present managing director, Mr. E. J. Millard. Mr. J. C. Hewlett himself undertook world-wide travels, visiting the Dominions, India, China, and other lands, and building up that connection with the whole of the British Empire which is to-day so characteristic of the firm's activities. As soon as facilities were granted to British manufacturers to ship their medicinal preparations in bond, Hewlett & Son immediately introduced the principle of standardization which has since been partly adopted by the British Pharmacopœia. Their 'Mist. Pepsinæ Co. c. Bismutho' and 'Liq. Santal Flav. cum Buchu et Cubeba' were registered as far back as 1884, whilst the owl trade mark, based upon the Hewlett crest, was registered in the same year.

A description follows of the present-day business and manufactory, illustrated by most interesting photographs. The aseptic room is of special interest; here bandages and dressings are sterilised, all air entering the room is filtered germ-free, and the room itself has not a corner or crevice in it. The laboratories, including the analytical laboratory, are under the charge of Mr. N. P. Millard, F.C.S.

The brochure concludes with a series of bibliographies of C. J. Hewlett, the founder of the firm, Mr. J. C. Hewlett (1908—1924), chairman of the firm and the first wholesale druggist to visit Bulawayo and the Zambesi, Mr. Vivian C. Hewlett, F.C.S., Ph.C., the present chairman, Mr. Edgar J. Millard, Ph.C., F.C.S., the present managing director, and Mr. J. D. Allman, M.P.S., director, who has been associated with the firm since 1871.

Messrs. Hewlett & Son may well be proud of this record. In the present days of trade depression and financial stringency, it is pleasant to read such a record of industry achieved by those virtues which earned for the great British firms of manufacturing pharmaceutical chemists the world-wide reputation which they rightly enjoy.

MESSRS. N. POWELL & CO., BOMBAY

In a recent letter from Messrs. N. Powell & Co., the well-known firm of surgical instrument makers and

manufacturing chemists of Bombay, we are informed that the firm, which was previously a proprietary concern, has now been converted into a private limited liability one.

The letter is accompanied by a very interesting account of the origins and growth of this firm. It was started in a small way in 1886 by the late Dr. Nair, a leading physician of Bombay. In 1899 the firm opened a small workshop for the repair of surgical instruments and the manufacture of orthopaedic appliances and artificial limbs, a novel departure in India, and one very badly wanted. In 1905 a contract of about Rs. 10,000 was obtained for manufacturing aseptic hospital furniture for the J. J. Hospital, Bombay. This was followed by a very rapid extension of this side of the business, a big order in 1909 from the Government of Bombay, orders from all over India, and even from Afghanistan. The old quarters at Duncan Road were found too small and a move made into commodious offices at the junction of Sandhurst and Lamington Roads in 1913. In 1918 separate buildings for their pharmaceutical work and surgical instrument work were erected on land near Club Road, and these were re-designed and re-built in 1924—a three storeyed, fire-proof, concrete building taking the place of the former works.

Industry, reliability, and conscientious work had laid the foundations of a sound and expanding business by 1913. In the Great War (as many medical officers who served with Indian troops will remember) Messrs. N. Powell & Co. rendered most valuable service. They were in a position to equip several war hospitals within a short space of time. They had completely up-to-date works, a trained and experienced staff of workers, and they equipped in turn the Lady Hardinge War Hospital, the Freeman Thomas War Hospital, the Colaba War Hospital and others; also the hospital ships 'Loyalty' and 'Madras', and base hospitals in Mesopotamia, Egypt and elsewhere. Finally, they were in a position to supply the artificial limbs, and orthopaedic and medico-electric apparatus needed by so many British and Indian soldiers returned from the different fronts, and this work expanded until a separate institution was equipped for it. In 1924 the Secretary of State for India-in-Council in recognition of their ability and fine workmanship officially appointed the firm contractors for supplying artificial limbs and orthopaedic appliances to soldiers and officers in the various military hospitals in India.

In 1922 the firm added a printing press to their other activities, rendered necessary by the expansion of their business. In their medico-electric institute they have full facilities for x-ray diagnosis and therapy, and for radium exposures in cases of malignant disease. In 1900 the firm were awarded the 'Grand Prix' for their surgical instruments at the international exhibition in Paris.

A special feature of the firm is its wide employment of Indian staff, Indian workmen, etc. We wish the firm every success under their new organisation.

'PEPTALAC', COW & GATE, LTD.

PREDIGESTED food is often a necessity in the sick room dietary, and especially so in gastro-intestinal cases and conditions of dyspepsia. Yet in India, where milk supplies are often open to grave suspicion, such predigested food is not always easy to obtain. Peptonisation of milk has to-day given place to pancreatisation, yet the latter has perforce to be carried out by rule of thumb, and under home conditions the process often stops short of finality, leaving the food unpalatable and of doubtful nutrient value.

'Peptalac' is a preparation by Cow & Gate, Ltd., the well-known manufacturers of roller dried milk preparations, and is stated to be a mixture of wheat and full cream milk pancreatised under skilled supervision, and subsequently powdered by the roller process of drying; it only requires the addition of hot water for its preparation. In palatability it is excellent, the fats

remain neutral and the bitter products of intermediate digestion are absent. Its composition is stated to be as follows:—

Moisture	..	..	3.0 per cent.
Fat	..	..	22.5 "
Proteins (peptones and amino acids)	..	..	8.0 "
Lactose	..	..	31.0 "
Converted and other carbohydrates	..	..	10.0 "
Mineral matter	..	..	6.5 "
			100.0 per cent.

Caloric value per ounce	..	138.5 per cent.
The predigestion effected totals about	..	30 "

It is obvious that the advent of this preparation places within the reach of all a predigested food of precision, convenient to prepare, requiring no skilled supervision, and relieves the lay home nurse of all anxiety while saving the time and trouble which hitherto have had to be expended on most present-day products sold for this purpose with no guarantee of securing tangible results.

'Peptalac' in common with all predigested foods is not of course curative, but it solves the problem of nutrition, the crux upon which so often the ultimate recovery depends. In all acute diseases, pneumonia, gastro-intestinal conditions such as ulceration and colitis, dyspepsia—pancreatic insufficiency—convalescence, and in old age, this precise subsidization of natural digestion is of great value.

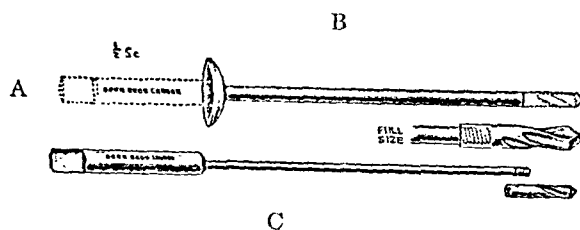
A NEW BONE DRILL

By A. SIMPSON SMITH, M.Ch. (Cantab.),
F.R.C.S. (Eng.)

Guy's Hospital, London

THE passing of wire, fascia, tendon, through bone is often beset with difficulty.

The following instrument has been designed to facilitate the easy passing of such ligatures.



Description.—The instrument consists of a drill head A, body B and cannula C. The body B consists of a proximal shoulder and distal shaft. The shoulder will fit any standard bone drill, whether of the 'Colt' or 'Archimedian' pattern as shown, or of the chuck pattern, the jaws of which will grip the shoulder immediately beyond the 'step' end. The shaft has a tip with a reverse screw threaded end to receive the detachable drill head A. The cannula C exactly fits over the shaft between X and Y and is of slightly smaller diameter than the drill head.

Uses.—The assembled drill is passed through the objective bone so that the drill head just clears the opposite side. An assistant immediately grasps the drill head A with a Lane's screw-holding forceps or other suitable tool. The surgeon reverses the drill action, thereby releasing the drill-head, and then withdraws the parent drill with the shaft B attached in one movement. Thus in quick sequence of drilling, reversing and withdrawing, a cannula is left in the bone through which

the desired wire or ligature can be passed. Withdrawal of the cannula completes the operation.

This device is not only very applicable to the 'binding' of patella fragments, but in fractures of the long bones of the limbs where open reduction alone fails to produce a stable reduction, binding material (of fascia, autogenous tendon or wire) can be readily introduced to effect this end. The small drill-head enables comparatively deeply situated bones to be so drilled, for only a small clearance—the length of the drill-head—is necessary on the contra-lateral side to the one easily exposed.

In the operation of teno-suspension for recurrent dislocation of the shoulder, as practised at the Mayo Clinic (1), should the surgeon so elect this particular operation, the introduction of the tendinous sling is very easy.

Five years ago Messrs. Down Bros. prepared a drill for me with the head and shaft made as a single unit, and fitting into a shoulder for universal attachment to all bone drills.



This device can still be used with ease for fractured patella and teno-suspension, but cannot be used where there is not a clearance equal to the whole length of the shaft and head, in the contra-lateral side of the bone. Its usefulness is therefore only very limited and chiefly applicable to the patella. Mr. Herbert Paterson (2) brought to the notice of the profession a drill somewhat similar to this earlier pattern.

My thanks are due to my chief Mr. E. C. Hughes, M.Ch., for so kindly allowing me to use this drill on cases under his care.

To Messrs. Down Bros., for their courtesy and patience in the preparation of numerous bone drills during the past five years, until this final product has been selected, I owe every admiration and thanks.

REFERENCES

Henderson, M. S. (1930). Habitual Dislocation of the Shoulder. *Journ. Amer. Med. Assoc.*, Vol. LXV, p. 1653.

Paterson, H. J. (1930). New Patella Drill. *Lancet*, Vol. I, p. 302.

INTERNATIONAL CO-OPERATION IN THE HOSPITAL FIELD

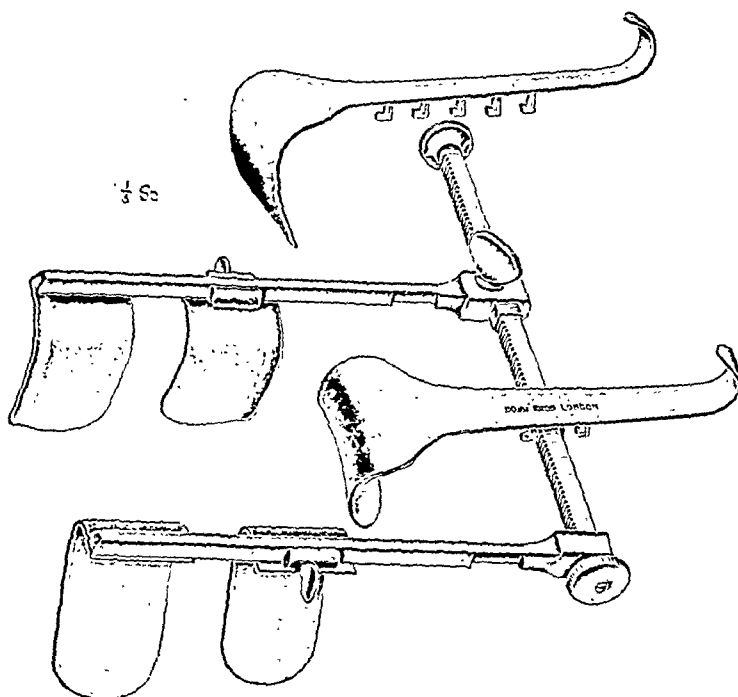
THE International Hospital Association, organized last summer, has already taken a very satisfactory development notwithstanding the world-wide economic depression. Up to the present, fifteen National Hospital Associations have joined it. Five of the eleven Study Committees organized have brought their preliminary work to such a point that it has been possible to print their programme of work in the second number of the third year of 'Nosokomeion' which has just been published. This quarterly is the official organ of the Association and is edited in Stuttgart by W. Kohlhammer. The Study Committees' programmes indicate the great number of questions connected with modern hospital services and constitute a collection of material which has been scientifically and systematically brought together; it will render valuable service in all professional fields and to all leaders who are developing hospitals into health centres for towns and districts. It lies with the responsible persons to use and adapt this material to the characteristics of hospital services in the different countries.

A NEW ABDOMINAL RETRACTOR

By Miss M. V. WEBB, L.R.C.P., L.R.C.S.

The Countess of Dufferin's Fund Council, New Delhi
MESSRS. DOWN BROS. have made for me a special modification of Berkeley's abdominal retractor which

should I think prove excellent. The most important point is the smooth opening and closing by the Jayle's rack, entirely doing away with the jerking motion.



They have also made plain solid lateral blades as I find the movable second blade of the Berkeley model is liable to get broken.

This is the best abdominal retractor for gynaecological surgery which I have used.

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Communications for the Publishers relating to Subscriptions and Advertisements should be addressed to THE PUBLISHERS, *The Indian Medical Gazette*, P. O. Box No. 54, Calcutta.

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The Editors of *The Indian Medical Gazette* cannot advise correspondents with regard to prescriptions, diagnosis, etc., nor can they recommend individual practitioners by name, as any such action would constitute a breach of professional etiquette.

Original Articles

THE INFLUENCE OF DIET ON PREGNANCY AND EARLY INFANT MORTALITY IN INDIA

By MARGARET I. BALFOUR, F.C.O.G., M.B.

and

SHAKUNTALA K. TALPADE, M.B.

(From the Haffkine Institute, Bombay)

A PAPER by the senior author recording some observations on early infant mortality in India was published in the *Indian Medical Gazette* some years ago. It stressed the importance of premature birth as a cause of early infant mortality, showed the relatively high incidence in India, and suggested that this might be due to some antenatal factor, leading to weakness either of the germ cell or of the developing fœtus or of both, possibly related to a maternal or parental dietary deficiency. It referred to the work done by Wills and Talpade on the diets of women in Bombay, in the course of which it was found that mothers who had given birth to premature infants were taking a significantly smaller quantity of vitamine B in the diet as compared with mothers who had given birth to full time infants.

With a view to enquiring further into the influence of dietary factors, and especially of vitamins, on pregnancy and premature birth, the senior author visited several places in India which might be expected to offer a sharp contrast in diet and investigated the food being taken by women who had given birth to full time and premature infants. In carrying this out it was necessary to select places where there were women doctors or nurses who were willing to look out the cases and assist in the visits and enquiries. The places selected were Madras, Travancore and Vizagapatam in the south, Lahore, Ludhiana and Delhi in the north. The tour was carried out in the autumn of 1930. The same method was followed as that adopted by Wills and Talpade in Bombay. The women were visited on five consecutive days and full particulars of the monthly expenditure on food, as well as of the daily meals, were taken. In each place it was easy to find mothers of healthy full-time infants but it was not so easy to find sufficient mothers of premature infants, born recently. Cases of stillbirth were debarred, also cases where there was some obvious cause for the premature birth, such as syphilis or toxæmia. In all, the diets of 29 mothers of healthy full-time infants and 29 mothers of premature infants were examined.

Comparison of the diets in the north and the south.

The diet in the south consisted mainly of rice. In Madras it was chiefly parboiled and milled. In Trivandrum it was usually parboiled

and hand pounded. In Vizagapatam it was usually raw and milled. The Vizagapatam rice thus contained least, and the Trivandrum rice most, nutritive material. In all these places cooked vegetables were used, but in small quantity. *Dāl* was sometimes taken, but in very small quantity. Sometimes only rice and pickles would be taken at a meal. Cocoanut was taken in fairly large quantity in Trivandrum, in smaller quantity in Madras and not at all in Vizagapatam. Cocoanut oil was generally used for cooking in Trivandrum, gingelly oil in Madras and Vizagapatam. Ghee was only used by the well-to-do. Wheat was only used by the better classes and then in small quantity. Ragi and cholam were scarcely used in these three places, although cholam was freely used in Guntur, a place midway between Madras and Vizagapatam. Coffee and milk were commonly taken, except by the very poor. Tapioca root, being cheap and filling, was largely partaken of by the poor in Trivandrum and sometimes in Vizagapatam. Meat was taken by non-vegetarians once or twice a week, but the quantity was very small. Fish was taken more often. Fruit was rarely taken, sweets mostly on special occasions. Enquiry was made as to the taking of 'toddy' which is obtained from the cocoanut palm and is a good source of vitamine B, but the reply always was that the men might take it, the women never.

The visit to the south coincided with the north-east monsoon when fresh fish was scarce and this, no doubt, contributed to the poverty of the diet. As the cases were found by the hospitals and welfare centres they were mostly of a very poor class.

The diet in the north consisted of wheat chapatis, *dāl* and vegetables, usually in good quantity. Milk was frequently taken, tea seldom, coffee never. Ghee was always used for cooking with one or two exceptions among the very poor.

Table I shows the composition of the average diet of the 29 nursing mothers in the north and in the south with a rough estimate of the vitamins.

It will be seen that the protein and fat values—and especially those of the animal protein and animal fat—are higher in the north, the carbohydrate value is somewhat lower, and the calories are about the same in the two series. There is a great difference in the vitamine content, A, B and C being much lower in the south.

The question at once arises, is there any difference in the incidence of premature birth in the north and the south, since there is such a marked difference in the vitamine content of the food eaten?

It is not so easy to reply to this question as might be expected for the following reasons:—

1. Maternity hospitals keep fairly accurate records of premature births, but the number of

TABLE I
(Grammes per day)

	PROTEIN		FAT		Carbo- hydrate	Calories	VITAMINES		
	Total	Animal	Total	Animal			A	B	C
North ..	66	21	53	46	332	2,113	++	++++	++
South ..	44	10	41	12	410	2,191	±	+	±

cases which are delivered prematurely may be expected to vary with the number of abnormal cases admitted to hospital. More abnormal cases would mean more premature cases. Speaking generally, in the south there is less prejudice against entering maternity hospitals and many cases of natural labour are delivered. In the north, the prejudice against maternity hospitals is greater and comparatively few cases of natural labour enter hospital. In the course of an enquiry made by one of us some years ago it was found that out of 1,663 deliveries in hospitals in the north of India 41 per cent. were abnormal and of 3,331 deliveries in hospitals in the south of India only 19 per cent. were abnormal.

2. Maternity and child welfare schemes should offer a good opportunity of getting reliable data about deliveries in the general population, but health visitors are generally slack about filling

to indicate that premature birth is more common in the south, especially taken in conjunction with the fact that fewer abnormal cases are delivered in hospital. But these figures need further confirmation.

Comparison of diets of mothers of full-time and premature infants

It is necessary to compare separately the diets of mothers seen in the north and the south, owing to the marked contrast in the food taken. It has not been considered necessary to compare separately that of the mothers in the different areas of the north and south, as the food, although it differed in detail, was the same in essentials.

Table II shows the average diet of the mothers of full-time and premature infants in the south.

TABLE II
(Grammes per day)

	PROTEIN		FAT		Carbo- hydrate	Calories	VITAMINES		
	Total	Animal	Total	Animal			A	B	C
Full time ..	44	10	41	12	410	2,191	±	++	+
Premature	44	10	44	11	395	2,168	±	++	+

in data which are not required for their monthly or annual returns and thus a source of information which might be valuable is lost.

3. Some of the health departments in the larger cities collect returns of the number of infant deaths due to prematurity, but in one city I found that all deaths occurring within the first 15 days were put down as premature, unless the person reporting gave some definite cause, which was rare.

I collected, however, a number of figures from maternity hospitals and maternity centres in the north and south. These had been carefully scanned and were thought to be reliable and fairly comparable. Of 4,069 cases delivered in the south, 411 or 101 per 1,000 were live premature births, while of 2,463 cases delivered in the north, only 93 or 37 per 1,000 were live premature births. This would seem

The table shows that there was little to choose between the two classes. The impression got was that all were in a state of avitaminosis so that a slightly increased effort such as the mothers of premature infants sometimes related—a railway journey, a long walk to the dispensary, a sudden fright at night—was enough to bring on labour prematurely.

Table III shows the average diet of the mothers of full time and premature infants in the north.

As in the former case there is not much to choose between the two diets; but, in the north, on making a careful investigation of the history of the cases, it was found that the mothers of the premature infants had, in the great majority of the cases, taken a different diet during pregnancy. Of the 16 women who delivered prematurely in the north only two had

TABLE III
(Grammes per day)

	PROTEIN		FAT		Carbo- hydrate	Calories	VITAMINES		
	Total	Animal	Total	Animal			A	B	C
Full time ..	66	21	53	46	332	2,113	++	++++	++
Premature	86	26	51	41	349	2,233	++	++++	++

taken the same diet during pregnancy. Ten related that they had lost appetite and especially took an aversion to wheat chapatis. This change was sometimes from the beginning but more often from the middle of pregnancy. They took rice instead. Two suffered respectively from pneumonia and diarrhoea and on that account had taken to a diet of rice, milk and sago, and one, although recovered, kept the diet up until the birth of the child at the eighth month. Two turned against ordinary food and lived on rice and rice water or milk. None of these 14 women, except those suffering from pneumonia and diarrhoea, were actually ill, but the articles of food which they gave up about the middle of pregnancy were those from which they commonly derived most of their vitamine B complex. They substituted for the wheat, milk and rice, and this would supply most of the calories, but failed in the supply of vitamine, especially vitamine B₁. An effort was made to reconstruct the actual diets they were taking during pregnancy, but, as so long a time had elapsed, it was impossible to get exact quantities. They could tell that they had given up one third, or one half, or the whole, of the usual chapati diet, one or two gave up meat also, one or two gave up milk also, some cut down their vegetables by one half. In each case it meant a sudden drop in the amount of vitamine B₁ to which the woman was accustomed and that just at the time when the growth of the foetus was making greater demands for this vitamine. In the diets, as reconstructed from the details given by the women, vitamins A and C were only slightly reduced but vitamine B₁ was reduced by one half.

In each of the northern towns visited medical practitioners remarked on the frequency of premature birth in connection with dysentery. One made the suggestion that the Flexner bacillus may lead to a non-assimilation of vitamine B. On the other hand it is usual, in the treatment of dysentery, to cut off such foods as wheat chapatis, from which the people in the north derive most of their vitamine B.

A village in the Punjab named Asrapur, where there is a women's hospital, carried on by Miss K. M. Bose, was visited. Miss Bose has organised a dais' training scheme, under which dais from many surrounding villages come

for teaching. They report the cases they deliver, the details are entered in a register, and Miss Bose or her assistant visits each one and checks the facts given. From this register and from the hospital register 1,762 cases of labour were collected, among which were 23 live premature births—that is a rate of only 13 per 1,000.

The diet in these villages consisted chiefly of wheat chapatis and *dāl* with milk, ghee or butter. Vegetables are not much taken as the zemindars only grow grain, and vegetables are grown by the mali caste. Hence such vegetables as are used are imported from the towns and are roughly three or four times as dear as in the towns. Meat was taken occasionally by non-vegetarians. The diet of six families was investigated, very roughly, as it was only possible to see and question the women on one occasion. The amounts of protein, fat, carbohydrate and calories were all higher than in the case of the townspeople, as also were the amounts of vitamins A and B. The amount of vitamine C was small, except in one case, where large quantities of vegetables had been taken.

The experience gained during this tour led us to see that it is not safe to conclude that a mother takes the same diet during pregnancy as during lactation, and if we wish to find out the effect of different diets on the course of the pregnancy or on the foetus, we must study the actual diet of the pregnant woman.

We realised this would be a big task, since it is not possible to foretell which woman will be delivered prematurely and so it is necessary to study the diet of the whole community.

A beginning was made at Bombay in January 1931. We explained our scheme to the Executive Health Officer of the city and he very kindly issued directions to the Assistant Health Officers and the municipal midwives to give us all possible help.

The method we adopted was to take up successively different districts of the city, with the aid of the municipal midwives, each of whom keeps a register of the pregnant women of her district. They took us to the houses where such women were to be found and on the first day we filled up a form, taking particulars

of the mother's history, conditions of life and surroundings and of the quantities of food-stuffs bought by her, either monthly, weekly or daily. We examined the actual meals taken the previous day as well as the day of our visit. We revisited on the third day. We thus had four days diet as well as the monthly purchases to construct the average diet form. In order to find the woman's share of the family diet we used 'Lusk's coefficients' a well-recognised formula which estimates the woman's share as 83 compared with 100 for the adult man, and respectively 75 and 50 for children of different ages. (The same formula was used in the previous enquiry by Wills and Talpade). We continued visiting the woman until after delivery, as far as possible once a fortnight, and noted any change of diet.

Speaking in a general way we were struck with the poor diet and small quantities of food taken by so many of these expectant mothers. All were poor. At the beginning there was a good deal of unemployment in the mills, owing to strikes, but by May this had ceased and the mills were in full working order. But only a few of our cases were mill workers and the economic conditions of all were bad, especially of the hired workmen. Shopkeepers and others were doing very little trade and dismissed their employes or gave them very reduced wages. The *sonars* or goldsmiths were especially distressed, as no one was in a position to require jewellery. This was in spite of the fact that living became progressively cheaper during the year. From January to December (1931) it fell 11 per cent. But if there is no money to buy food with, it does not help much if rice falls from 5 annas 9 pies a *pyli* to 4 annas a *pyli*. It must be remembered too that when a family is short of food it is the mother who suffers most as she gives it to her husband and children.

The diets we obtained were distinctly poorer than those obtained by Wills and Talpade in the previous year, showing the deterioration which the unsettled conditions in the city produced. It is worthy of note in this connection that the incidence of premature birth in the Cama and Allbless Hospital was 16 per cent. in 1930 and 19 per cent. in 1931.

The work was carried on for the first three months by both the present writers. It was then carried on by the junior writer and was concluded by her in December 1931 as there were no further funds available for its continuance.

In all 314 cases of pregnancy were visited and particulars of the diet taken. Thirteen of these were later excluded, chiefly because they left Bombay. Three hundred and one diets have been classified and 290 of the women concerned were watched up to delivery.

Two hundred and fifty-five infants were born at full time. Of these 191 were healthy

(including 10 very healthy), 63 were weakly or unusually small, including 2 stillbirths. Twenty-five infants were born prematurely, living. Ten infants were born prematurely, dead. Thirteen of the infants died. Only one visit was paid after delivery, otherwise the number of deaths would certainly have been greater.

Six mothers died. Four deaths, so far as could be learned, were from puerperal sepsis, one from a condition suspected to be tubercular, one died undelivered from anæmia and epistaxis. Many of the mothers—about 38 in all—suffered from anæmia, slight or severe.

The family income varied from Rs. 20 to Rs. 60 per month. The general conditions of life were similar. The Mahommedan women were more secluded, but purdah was not strict.

The women belonged to many different castes and communities and had different customs as to diet. With some, rice was the staple food-stuff, with some, wheat or bajri. All took *dāl*, but usually in small amount. Many, in addition, took a little grain. The amount of milk, fresh vegetables and ghee taken was very small. In many cases no ghee was used, cooking being done with vegetable oil. Tea was commonly taken once or twice a day and usually contained a little milk. Meat or fish was taken in more than two-thirds of the cases, but the amounts were very small. It was seldom taken more than twice a week, sometimes only twice a month.

In a number of cases the family rice was tested with tincture of iodine. Where the rice is fully milled a blue colour appears, but where the pericarp is still present the blue colour is absent. In all the samples tested the rice was found to be fully milled and thus very lacking in protein and vitamine B₁. Some of the people took '*patni*' a rough-ground rice, containing more of the pericarp, but they took it in small quantity only.

Table IV shows the average diet of the 301 pregnant mothers contrasted with the average diet of the 35 mothers who delivered prematurely. Below is shown the average diet found by Wills and Talpade in 1929-30, among women of a similar class. As the particulars in both enquiries were taken by the junior author of this paper, it indicates that the nutrition of the people was distinctly lower in 1931, and this is the opinion of the junior author from her general observations.

In this table the vitamins have been shown by the same system of 'arbitrary units' as employed by Wills and Talpade, for the sake of comparison.

The system of arbitrary units is not wholly satisfactory, as we have no guarantee that the numbers chosen for the different foodstuffs are correct. It will be well therefore to compare

TABLE IV
(Grammes per day)

Total cases	Protein	Fat	Carbo- hydrate	Calories	VITAMINES		
					A	B	C
301	44	25	273	1,518	23	73	28
Premature cases—35 ..	34	23	233	1,323	16	52	25
W. & T. 70 cases ..	54	46	308	1,860	31	83	47

the diets from another point of view, namely, that of the foodstuffs taken.

The chief sources of vitamine B complex in these diets are wheat, bajri, juari, *dāl* and vegetables. The vegetables and usually the *dāl* were taken in small quantity and both were very thoroughly cooked, so it is possible the

The numbers are small, but the differences, especially as regards premature birth, are marked.

If we assume for the moment that there is something in the maternal diet of wheat or bajri more favourable to the continuance of the pregnancy and to the nutrition of the unborn

TABLE V

	Number of cases	Healthy, full time	INFANTS	
			Weak	Premature
50 per cent. calories from rice ..	55	30 (53 per cent.)	14 (25 per cent.)	11 (19 per cent.)
50 per cent. calories from wheat or bajri.	28	25 (88 per cent.)	3 (12 per cent.)	Nil

full value of the small amount of vitamine B present was lost. Juari was rarely taken. The important sources of vitamine B₁ then were wheat and bajri. Some of one or other of these grains was present in 250 of the diets, but the quantity was frequently very small.

child than rice, the next question is, how much is needed to enable the mother to produce a healthy full-time child? In order to throw light on this, the 290 cases, the result of whose deliveries are known, have been classified as follows :—

TABLE VI

	Number of cases	Healthy, full time	CONDITION OF INFANTS		
			Weak	Premature	Infant deaths
Diets with 8 ounces or more wheat or bajri.	33	29 (87 per cent.)	3 (8 per cent.)	1 (3 per cent.)	Nil
Diets with 4 to 8 ounces wheat or bajri.	81	54 (67 per cent.)	22 (27 per cent.)	5 (6 per cent.)	3 (3.7 per cent.)
Diets with less than 4 ounces wheat or bajri.	136	87 (63 per cent.)	27 (19 per cent.)	21 (15 per cent.)	6 (4.4 per cent.)
Diets with no wheat or bajri.	40	21 (52 per cent.)	11 (27 per cent.)	8 (20 per cent.)	3 (7.5 per cent.)

In table V the conditions of the pregnancy and of the infant are shown in two series of mothers (a) those in which 50 per cent. or more of the calories are derived from polished rice, (b) those in which 50 per cent. or more of the calories are derived from wheat or bajri.

It will be seen that the percentage of premature cases in each class increases as the amount of wheat or bajri decreases.

From this it appears that the most satisfactory diets are those which contain at least 8 ounces of wheat or bajri. This is not

surprising. In the north of India where wheat is the staple foodstuff women commonly take from 8 to 16 ounces daily and even more.

The question then arises why the wheat or bajri diet should be more favourable. Both these grains are rich in protein, both contain a modicum of vitamin A and a large supply of vitamin B₁. Wheat germ oil is also a rich supply of vitamin E and is probably present in the rough-ground *ata* commonly taken by the people. This vitamin is believed to have a strengthening effect on the human germ cell and a lack of it has been suggested as a cause of abortion and premature birth (Whitehouse, etc.).

The average protein consumed by the 35 mothers of premature infants was 34 grammes per day as compared with 44 grammes for the whole series of 301 cases. The average protein consumed by the 56 mothers whose calories were composed of over 50 per cent. polished rice was 37 grammes per day as compared with 52 grammes per day for those whose calories were composed of over 50 per cent. wheat or bajri.

It is therefore possible that the more unsatisfactory conditions of the infants in the smaller series, shown in table V and in the third and fourth divisions of table VI, may have been due either to lack of protein or to lack of vitamin B. If the former, it is not an easy matter to remedy, for it would mean altering the staple foodstuffs of numbers of the people and that would be a difficult or impossible task to carry out. If due to a lack of vitamin B complex it would be more easily remedied, by the addition of cheap forms of vitamin B to the ordinary diet. Recent research by Sure and others has shown that the nursing mother must have a good supply of vitamin B in her diet if the young are to keep good health and grow normally—so, arguing from analogy, a good supply of vitamin B in the mother's diet should be necessary to secure the health and normal growth of the foetus.

We have to express our gratitude to the Countess of Dufferin's Fund, which financed the earlier part of the enquiry from funds for research collected by Lady Irwin. The cost of the later part of the enquiry was undertaken by the Indian Research Fund Association, but was shortly afterwards discontinued, owing to retrenchment. The Countess of Dufferin's Fund again came to the rescue to enable the enquiry to be concluded. Much more remains to be done in following out this line of investigation both clinically and experimentally and it will be a pity if the comparatively small sums needed are not forthcoming.

In the course of this enquiry we have received a great deal of assistance from the health officers, medical women and health visitors of the different towns where the work was carried on, and especially from Dr. Nerulkar, the Executive Health Officer, Bombay. We should

(Continued at foot of next column)

A NEW CONCEPTION IN THE TREATMENT OF PUERPERAL SEPSIS*

(AN INTERIM REPORT ON THE VALUE OF VITAMIN A IN THE TREATMENT OF PUERPERAL SEPSIS)

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and

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PUERPERAL sepsis has been known for a long time to be one of the chief causes of the continuously high maternal mortality in this and other countries. In spite of the great advances in antiseptic and aseptic midwifery, and in spite of the fact that we have a much better conception of the nature of infection and of pathogenic organisms, the returns of the Registrar-General in England go to show that within the last 30 years there has been little or no improvement in either the maternal mortality or the maternal morbidity rates in Great Britain. This has naturally led to a great deal of enquiry, but unfortunately few tangible results have been achieved.

The problem of puerperal sepsis is a complicated one. It must be within the experience of most obstetricians that it is little use trying to prophesy whether a case delivered after great difficulty will or will not develop a severe form of puerperal sepsis. We have been often struck by the fact that while a severe septicaemia has resulted in a case wherein no artificial interference has been attempted, in another where the delivery was effected after a prolonged second stage with instruments, with probably severe lacerations and with the inevitable post-partum hæmorrhage, the patient has often had an apyrexial puerperium. It is little use saying that it is all a question of infection; that in the one case, perhaps, organisms gained admission, while in the other they did not; or to lay the blame on the obstetrician whenever a case gets septic.

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(Continued from previous column)

like to express our gratitude to them all and also to Lieut.-Col. Taylor, Director of the Haffkine Institute, Bombay, and to Dr. Lucy Wills, for much kind help and advice.

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Thinking of puerperal sepsis and its incidence, one is naturally reminded of the parable of the sower and the seed. Some seeds fall on fertile ground and grow abundantly while others fall on barren soil and take but little root. We have perhaps concentrated too long upon the sower and the seed. The obstetrician's technique has become more and more perfected—with gloves, with overalls, with masks, with the protected area—almost imitating a surgical operation; and yet, the incidence of puerperal sepsis has not materially lessened. While as regards the seed, investigations have been carried on by Whitridge Williams, by Fitz-Gibbons, and by several other obstetricians, as to the incidence of pathogenic organisms in the vagina of the pregnant woman in the later months, during labour and immediately after. The result has been a confused medley of facts, demonstrating the presence of pathogenic organisms in several cases where the puerperium has been completely apyrexial.

These observations lead naturally to the thought that perhaps the soil is the one factor that has not been sufficiently taken note of: and that if the soil is resistant, organisms will hardly have a chance of growing. It is our object in this paper to show that the study of the soil will perhaps be as fruitful of good results in the solution of this most complex problem, as any method of investigation that can be carried on in the treatment of puerperal sepsis.

Mellanby and Green (1929) presented a preliminary report drawing attention to the fact that deficiency of vitamins, particularly vitamin A, was a most potent factor in the causation of puerperal sepsis. Their experiments on animals revealed the interesting fact that if a good supply of vitamin A was continued, the animal did not develop infection in the puerperium. They proceeded on this basis with experiments on women during the puerperium, and although the cases were not numerous, the results were striking. Continuing these experiments, they published in 1931 a further series of cases from the Sheffield Lying-in Hospital, which also demonstrated the efficacy of vitamin A in the treatment of puerperal sepsis. It is on these observations that we have conducted a line of treatment in puerperal sepsis which has given such encouraging results so far, that although the number of cases is limited, we have thought it worth while placing our experience before the members of this Association in the shape of an interim report.

The rôle of vitamin A in the prevention of infection in various specialised tissues of the body is well known. Deficiency of this vitamin is now known to cause an inflammation of the cornea resulting in the disease known as keratomalacia. In the growing infant, deficiency of vitamin A is responsible for infection in the lungs and in the intestines resulting in broncho-

pneumonia and diarrhoea, two of the common complications of the disease known as rickets. And recent researches go to show that deficiency of fat-soluble vitamin A is responsible for inflammation of the mucous membrane in the stomach and keratinization in the mucous membrane of the bronchial tubes, uterus, ureters, etc. It is because of these varying effects that Mellanby suggested the name 'anti-infective vitamin' for vitamin A. It seems to us that there are certain mucous membranes peculiarly susceptible to a deficiency of vitamin A and one such mucous membrane is the lining membrane of the uterus, or the endometrium.

It would appear that deficiency of vitamin A becomes more pronounced during pregnancy on account of the demands of the foetus, and it is a well known fact that the deprivation of large quantities of certain essential constituents for the development of the foetus throws an added strain upon the mother. If therefore the uterine endometrium is rendered more susceptible—in other words, if the soil is prepared—it is no wonder that any infection, either exogenous or endogenous, is sufficient to light up a more or less severe form of puerperal sepsis, depending upon the degree of hypovitaminosis of the patient. We consider that in puerperal septicaemia, the condition is more approaching avitaminosis than hypovitaminosis; and that the essential, or at least one of the most essential, features in the treatment of puerperal sepsis should be the adequate supply of vitamins, particularly vitamin A.

We shall now submit the reports of the cases wherein we have tried this method of treatment.

Case 1.—Primipara, age 20, examined before admission, delivered naturally in the hospital on the 2nd March, 1931, the general condition on admission being:—Fair, no anaemia, heart and lungs normal; oedema of legs present. The patient had a rise of temperature to between 102° and 104°F., on the fourth day after delivery, and the lochia were offensive. On the ninth, the uterus was explored with gloved fingers, but no membrane or placental remains were found and the offensive discharge continued. This patient was treated for the next twenty-nine days on the lines hitherto adopted. She had three injections of neutral iodine, three injections of anti-streptococcic serum of 30 c.cm. each, puerperal vaccine, three injections of tincture of iodine, one injection of cytatropine, five injections of quinine and one injection of sulpharsenol. But in spite of all this treatment, the temperature persisted between 101° and 102°F., and for the first time, on the 7th of April, she was put on cod-liver oil. On the third day after this the temperature was 100°F., and on the fifth day, it fell to normal and continued normal for the rest of the puerperium. During this period no other treatment was adopted.

Case 2.—A primipara was delivered at her home seven days prior to admission. Fever began on the third day after confinement, and the condition on admission was as follows:—Patient anæmic; tongue clean and moist; uterus not involuting properly, extending up to the umbilicus, cervix bruised; temperature 103.4°F.; râles and rhonchi heard over both bases of lungs and profuse expectoration. The patient was started on the usual treatment for puerperal sepsis. The head of the bed was raised; saline douches four hourly; pituitrin injections and ergot and quinine mixture; anti-streptococcic serum 40 c.cm. daily for three

consecutive days with 50 millions of puerperal vaccine on the first day. There was no improvement in her condition and the temperature was ranging between 100° and 105°F. On the sixth day after admission, the patient was put on vitamin A in the shape of Adexolin capsules—one three times a day. The next day the temperature came down to normal. The supply of Adexolin capsules being exhausted, nothing was given on the ninth and tenth days, and on the latter, the temperature shot up again to 105°F. The patient was put on cod-liver oil on the eleventh day. The temperature came down to normal on the twelfth and continued to be normal for the rest of the puerperium.

Case 3.—Primipara, age 20, admitted into the hospital in labour after having been handled by a barber midwife and given up as a hopeless case. Pulse 124, sweating profusely, tongue dry and coated, both labia swollen and abraded, uterus acting strongly, position of foetus R. O. A., axis traction forceps applied and a still-born female child extracted. The next day the patient was examined and it was found that the vagina and cervix were badly lacerated and bruised, and there was a foul discharge; temperature 103°F.; daily injections of anti-streptococcic serum 40 c.cm. were given for three days. There was no improvement in the temperature. Neutral iodine injections 1 to 3 c.cm. daily for the next five days were tried, but without any improvement. The parts were getting slightly cleaner and sloughs were coming away, but the discharge was offensive and purulent. The patient was started on cod-liver oil, on the seventh day after admission, and in the course of thirty-six hours, there was a marked improvement—the temperature came down to normal three days later and continued normal. This patient was put on a preparation known as 'Super-D cod-liver oil of Upjons', which contains both vitamin A and vitamin D in highly concentrated form, and we have since been experimenting with this particular preparation of cod-liver oil on all our cases.

Case 4.—A primipara, admitted in a semi-conscious condition, having had six fits at home, the blood pressure on admission being 126 mm. of mercury; membranes ruptured at 8 p.m. on the night of admission and she was delivered after application of forceps of a deeply asphyxiated child which was revived in the usual manner. On the third day after delivery, the temperature shot up to 103°F.; the lochia were offensive, and the patient very restless. She developed puerperal mania later and on the seventh day after admission, she was put on super-D cod-liver oil, and injections of ergotin 1 c.cm. daily. The restlessness gradually disappeared, the condition of the patient improved considerably and after four days the temperature came down to normal and remained normal for the rest of the puerperium.

Case 5.—Second para, age 25, was admitted with a history of having been in labour for twenty-four hours, the membranes having ruptured twelve hours ago, the arm was prolapsed, and swollen; vulva cedematous, uterus strongly contracting, foetal heart inaudible—a case of neglected shoulder presentation. The foetus was delivered after decapitation and the placenta had to be removed manually. In view of the fact that this patient was handled outside and came in, in a condition where sepsis could almost be prognosticated with certainty, she was put on cod-liver oil from the date of delivery as a prophylactic measure. Excepting for a short rise of temperature, on the third day, which was due to the condition of the breasts, the puerperium was almost uneventful.

We have tried, on over a dozen cases, the administration of cod-liver oil, either in the form of super-D cod-liver oil or in the ordinary form, as a prophylactic measure and, in every one of these cases, the puerperium was almost apyrexial and the morbidity rate was less. The cases included forceps deliveries, manual removal of the placenta, extraction of breech,

adherent placenta manually removed after delivery, vesicular mole and some cases of natural delivery handled outside the hospital. Out of the twenty-five cases wherein this treatment was adopted, and little or nothing else done, our results have been quite satisfactory in twenty-four. The one case where it did not succeed was a case confined outside the hospital seven days before and admitted with a temperature of 104.4°F., a pulse of 144, general condition poor, râles and rhonchi heard in both bases; patient suffering from puerperal septicæmia, tongue dry and coated and she died thirty-six hours after admission.

Conclusions

1. This being a preliminary report, we do not propose to make any definite statements as to the efficacy of vitamin-A therapy in puerperal sepsis.

2. Our experience, so far, encourages us in the hope that this line of treatment is one which may be carried on with increasing success. The administration of super-D cod-liver oil as a prophylactic during pregnancy has been found by one of us (A. L. M.) to be exceedingly useful in cases where a difficult labour may be anticipated.

3. Super-D cod-liver oil has been given as a prophylactic after labour in those cases where septic complications were likely to arise and it has yielded so far uniformly good results.

4. The administration of cod-liver oil in certain prolonged fevers in the puerperium associated with signs of sepsis has tended to bring down the temperature in a short time.

5. We believe that the morbidity rate will be considerably lessened by the use of vitamin A and that the range of morbidity will also be proportionately lessened by the use of this preparation.

We are now investigating the types of diet used by pregnant women here and in other parts of Southern India with a view to finding out how much of vitamin A they contain and we hope to submit our results at a later meeting. We have used Adexolin capsules and super-D cod-liver oil—two of the preparations which are supposed to contain a high degree of vitamin A. In the absence of either of these preparations, the ordinary cod-liver oil supplied by the Medical Store Depot has also yielded fair results.

In conclusion, we wish to make it quite clear that we have not suggested in our emphasis upon the soil as one of the most important factors in the causation of puerperal sepsis, any slackening as regards the aseptic and antiseptic precautions needed in the conduct of delivery. But we venture to believe that this aspect of the question requires much closer investigation and probably would yield better results ere long; and it is in this hope that we have presented this preliminary report. Though the number of cases may not be large, the striking

(Continued at foot of opposite page)

PLATE



Fig. 1.

Case 2.—Inverted uterus with the fibroid attached to the fundus. (Specimen preserved in the Pathological Museum, Campbell Medical School).

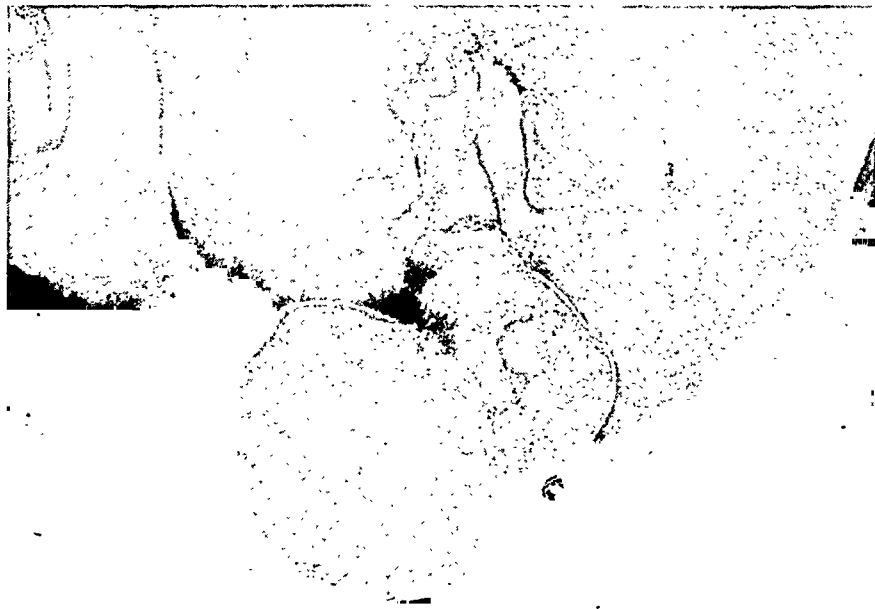


Fig. 2.

Case 4.—Photograph taken immediately after admission.



Fig. 4.

Case 7.—The uterus is cut open to show the contents of the inversion funnel.



Fig. 3.

Case 7.—Mucous membrane rough and denuded. Note the bristles passing through the openings of the Fallopian tubes.

INVERSION OF THE UTERUS*

A REPORT OF EIGHT CASES WITH COMMENTS ON TREATMENT

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THE following eight cases of inversion of the uterus have come under my personal observation during a period of 40 years the cases actually occurring between 1903-23. I record these cases owing to their rarity. Of these 8 cases, 4 have been of obstetric origin, and the other 4 of gynaecologic origin.

Case 1.—A delicately built Bengali Hindu girl, aged 11 years 10 months (age of husband 17 years 6 months), of 41, Sukea Street, Calcutta, was seen by me on 5th July, 1903, at about 1 p.m. in profound shock. I was informed by the midwife that the child had been born about an hour previously and that the patient became collapsed immediately after the birth of the child with the protrusion of the womb out of the vulva. The placenta was peeled off by the midwife and the womb was placed inside the vagina. There was practically no bleeding. On examination the completely inverted uterus was found filling the vagina. After dealing with the shock, the uterus was replaced under chloroform without any difficulty. Recovery was uneventful except for some parotid inflammation. On enquiry I found there was no attempt at expression of the placenta nor pulling on the cord.

Case 2.—Parboty, a Bengali, Hindu (Brahmin), aged 34, a multipara, her last child having been born 2 years previously, was admitted into the Campbell Hospital on 20th July, 1904, with a gangrenous fibroid attached to the fundus of an inverted uterus, protruding out of the vulva for seven days before admission.

On 21st July, 1904, the inverted uterus with the fibroid was removed vaginally. The patient did fairly well till the morning of 29th July, 1904, when she complained of pain in the abdomen which became tympanitic and the pulse became feeble. She rapidly got worse and died at 5 p.m. the same afternoon. During the 8 days after operation the highest temperature recorded was 101°F. and the highest pulse rate was 120 on the evening of 28th July, 1904.

Case 3.—Sonamani Dasi, a Bengali Hindu woman, Sakari by caste, aged 40, 3-para, last child born 8 years previously, residing in village Kodali (24-Parganas), was admitted into the Campbell Hospital on 9th February, 1906, with a sloughy mass of about the size of a foetal head protruding from the vulva. It was stated that the mass came out of the vulva about a week before while the patient was straining at stool.

It may be mentioned that the mass came out of the vulva on 6th February, 1906, when she was brought down to Calcutta from her village Kodali 24 miles from Calcutta. She was refused admission to the hospital to which her relatives took her on the ground that the case was septic and there was no accommodation for such cases. She was taken back to her village but as

the mass was getting putrid and more offensive she was brought down to Calcutta again and was admitted into the Campbell Hospital.

Her menstruation had been fairly regular till about 6 months previously, since when it had been very profuse and prolonged.

The mass was a sloughing fibroid attached to the inverted uterus. There was a crescentic slit at the top of the mass anterior to it, showing how the tumour which was apparently attached to the upper part of the posterior wall of the uterus came out, through the os uteri, inverting the uterus.

The patient was extremely weak and anæmic with a marked hæmic murmur. Her feet and face were oedematous.

Operation.—Under chloroform an elliptical incision was made at the base of the fibroid, which was enucleated easily. The edges of the incision, consisting of a thin layer of uterine tissue, were brought together by a few deep silk sutures. The uterus could be easily replaced by manipulation and was packed with gauze. She was discharged from hospital on 7th April, 1906, in good condition.

Case 4.—Pramada Sundari Debi, a Bengali Hindu woman, aged 40, 11-para, last child born 3 years previously, was admitted into the Campbell Hospital on 24th May, 1906.

Previous history.—Menorrhagia, metrorrhagia and pain in the lower part of the abdomen for two years. Fifteen days before her admission to hospital, a mass of the size of a foetal head came out of the vulva. The mass bled profusely and there was an offensive discharge.

Patient was very weak and anæmic on admission. The sloughy mass protruding from the vulva was found to be a fibroid attached to the fundus of an inverted uterus.

The fibroid (weight 16½ ozs.) was shelled out and the edges of the wound were brought together by a few stitches. The inverted uterus could not be replaced and was pushed into the vagina. The size of the uterus gradually diminished. The general health of the patient also steadily improved.

Several manual attempts at reposition having failed, the patient was put under chloroform on 10th July, 1906 (i.e., 45 days after her admission), an incision was made to open the vesico-uterine pouch. The anterior lip of the cervix, up to the constriction, was divided and an attempt was made at reposition, which however failed. The uterus therefore was removed by complete hemisection and ligation of the broad ligaments.

Recovery was uneventful. She was discharged from hospital on 2nd August, 1906.

Case 5.—Mrs. X, a Bengali Hindu girl, aged 12 years 3 months, of 42, Mukhtaram Babu Street, Calcutta, was confined on 2nd July, 1907, of a full term baby after a rather prolonged labour. The patient was attended by an indigenous *dhai* who is said to have pulled on the cord as the placenta did not come away naturally. Evidently the uterus became inverted and the *dhai* peeled off the placenta and put the inverted organ inside the vagina.

The patient had a temperature of 102°F. with pain in the lower abdomen and an offensive discharge, for which Dr. Akshay Kumar Nandi* was called in. Dr. Nandi requested Dr. Mrs. Ganguli to make a vaginal examination, when the completely inverted uterus was detected filling up the vagina.

I was called in by Dr. A. Nandi on the fifth day after labour and found the completely inverted uterus in the vagina. On the afternoon of the same day a further consultation with Colonel Green, I.M.S., was suggested. The condition of the patient at the time was worse than the day before, the temperature being above 104°F. and the pulse very rapid. Colonel Green suggested immediate replacement under chloroform. I was of opinion that the patient would not be able to bear the operation. An attempt was however made by Colonel Green to replace the organ, which proved unsuccessful and the patient died soon after.

* A paper read at the August 1931 meeting of the Calcutta Branch of the British Medical Association.

(Continued from previous page)

evidence we have so far obtained makes us feel that we may well feel justified in bringing it to the notice of this Association.

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It was stated that she first menstruated at 10½ years. At that time she suffered from fever which was thought to be due to tuberculosis of the lungs. She however became free from fever and improved in general health within a few months and conceived when she was about 11½ years of age.

Case 6.—Nistarini Dasi, Hindu, Bengali, aged 44, was brought down by her son from Simurati, Nadia District, and admitted to the Campbell Hospital on 16th April, 1907. She noticed a tumour in the lower abdomen about six months previously, which had been gradually increasing in size. Six days before admission a large mass came out of the vulva while straining. The mass gradually became 'greenish and putrid'. She had given birth to 12 children. Menorrhagia since the birth of her last child 19 years ago. A constant watery offensive discharge for the last two months.

On admission to hospital a large pear-shaped mass was seen protruding through the vagina. It was clearly a submucous fibroid attached to the fundus of an inverted uterus. The line of attachment could be detected by a faint depression. No collar of the cervix was detectable, but the vaginal mucous membrane was continuous with the lining of the uterus. The openings of the Fallopian tubes could be seen. The bladder was prolapsed with the vagina.

Operation.—Having accurately determined the relations of the tumour to the inverted uterus, the fibroid was easily enucleated. The tumour weighed 11 ozs. A gentle attempt was then made to replace the inverted uterus, but without success.

Several subsequent unsuccessful attempts were made to replace the inverted uterus. The patient's general health did not improve much. She was very anæmic with œdema of the feet, etc.

She left hospital on 11th May, 1907, promising to return later on, for further treatment (*i.e.*, hysterectomy). No further information was obtainable about her.

Case 7.—Mrs. Dutta, a Bengali Hindu woman, aged 25, of 36/8, Hogolkuria Gally, Calcutta, was admitted into the Carmichael Medical College Hospital with a history of irregular bleeding since the birth of her last child. Examination revealed an inverted uterus, which was amputated through the vagina on 13th March, 1922. Recovery was uneventful and she was discharged cured on 21st April, 1922.

The external surface of the specimen shows the endometrium denuded in some places. It is cut open, to show the remnants of the appendages and portions of the broad ligaments pushed down into the peritoneal pouch of the inverted uterus.

Case 8.—A Bengali Hindu rather obese girl, aged 16, was seen by me in 1923 in consultation. It was stated that she was delivered of her second baby the evening before. The uterus became inverted immediately. The placenta was attached to the uterus. Dr. Dey, who saw her immediately, detected the placenta and tried to replace the uterus but failed. He merely pushed the inverted uterus into the vagina. At this stage Dr. Kundu came in. The patient was in a condition of grave shock. After she revived a little, a further attempt at reposition was made by Dr. Kundu under chloroform with success. I saw the patient next morning. She developed a temperature and evidently there was mild puerperal infection. She recovered within a few days. I had an opportunity to see her again in July 1932. There has not been any further pregnancy since 1923. She has been getting stouter steadily and the menstruation is becoming gradually scantier.

Comments on the treatment of these cases

(a) Acute cases of inversion seen soon after the accident, whether of obstetric or gynæcological origin, offer no difficulty—immediate manual reposition is almost always successful.

(b) Cases, however, which are seen 48 hours

or more after the occurrence of inversion, require careful consideration regarding the procedure to be adopted in treating these cases. Case 2 of gynæcological origin and case 5 of obstetric origin are germane. Both of these patients died, one from septic peritonitis and the other from shock. From my unfortunate experience of case 2 and the behaviour of chronic cases, I was strongly against an attempt at reposition in case 5. The superficial necrosis of the endometrium and the consequent offensive discharge with symptoms of infection have been regarded as due to strangulation of the inverted uterus, but, as I have already pointed out, the chronic cases disprove such a theory. The uterine blood supply is never completely cut off, as has been theoretically assumed. I am definitely of opinion that no vigorous attempt at reposition nor immediate surgical intervention should be made in cases under this category.

(c) Cases of chronic inversion have to be dealt with according to the special circumstances of the individual case. If the patient is particularly anxious that her uterus should be preserved, it is permissible to resort to one of the various ingenious operations that have been devised for the purpose, but as a rule my preference is for amputation of the inverted uterus in cases met with in hospital and private practice amongst Bengali women (Hindu widows and elderly women). The operation is simple and the mortality practically nil.

HEXYLRESORCINOL AS AN ANTHELMINTIC

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and

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THE history of the use of hexylresorcinol as an anthelmintic is only of about two and a half years duration, and, up to date, all that has been published on the subject is by Lamson and his co-workers in America. The study of this drug in the treatment of intestinal worm infections is part of an extensive systematic search for efficient and non-toxic anthelmintics that is being carried out in America. This is an extremely valuable investigation, and one which in the end we hope will furnish us with much improved remedies for the treatment of these conditions.

Lamson, Ward and Brown (1930) in a preliminary paper first drew attention to the possibilities of hexylresorcinol as an anthelmintic, and this paper was followed by one written by Lamson, Caldwell, Brown and Ward (1931) giving details of treatment and its results. They found that doses of one gramme were the optimum for adults, and they gave the drug in hard gelatine capsules, to avoid its irritating action on the buccal mucous membrane. It was also soon discovered that food either shortly

before or after the treatment greatly lowered its efficiency. In one series of cases treated on the above lines, with a purgative of magnesium sulphate two hours after the drug was given, seven out of ten cases of ascariasis were completely cured and there was a total egg reduction of 96.4 per cent., and in five other cases in which the magnesium sulphate was not given until twenty-four hours afterwards, all were cured with of course an egg reduction of one hundred per cent. In both these instances as well as in the figures quoted below, Lamson and his collaborators used, either the Stoll egg-counting method, or its modification by Stoll and Hausheer, for estimating both the egg reduction and cure rate. In another series of tests carried out under field conditions Lamson, Brown, Robbins and Ward (1931) obtained results similar to the above in the case of ascariasis; they also treated a number of children infected with hookworm, and they obtained an egg reduction of 80 to 90 per cent. with a single dose of hexylresorcinol, but the actual number treated and the percentage cured is not given.

Lamson, Caldwell, Brown and Ward (1932) carried out comparative tests between hexylresorcinol and heptylresorcinol and came to the conclusion that the latter drug was not as efficient as the former. Among the figures given in this paper there is a table showing fifteen cases of ascariasis that were given one gramme and two cases that were given 0.8 gramme of hexylresorcinol with 29.4 per cent. of complete cures and an egg reduction of 73.5 per cent. In the case of hookworm infection twenty-five cases were given one gramme of hexylresorcinol, none were cured and there was an egg reduction of 62.7 per cent.

The next paper on the subject was a general one on anthelmintics by Lamson and Ward (1932) in which considerable space is devoted to hexylresorcinol and several tables are given from which it is difficult to abstract information for comparison with other results. In a final paper on anthelmintics Lamson, Brown and Ward (1932) state that they consider a single dose of hexylresorcinol will remove 90 to 95 per cent. of ascaris, 80 to 85 per cent. of hookworms, and 40 to 45 per cent. of trichuris. The number of cases estimated to be actually cured in these instances is not given, but in their most recent series of 263 cases of ascariasis they state that 75 per cent. were cured and that there is an egg reduction of 90 per cent.

In our own series of cases we have followed the recommendations of Lamson and his co-workers regarding regulation of diet, and we also gave all our treatments in hard gelatine capsules in doses of one gramme. Lamson and Ward (1932) reported that gelatine capsules are not suitable for large scale treatments because gelatine and hexylresorcinol interact in the presence of

moisture, so they now recommend using sugar-coated pills. In our use of the drug this recent finding is of no importance for the capsules were only filled as required and administered immediately.

All our patients were admitted to hospital at least on the day prior to treatment, so that our trials of this treatment could be properly controlled; and most of them had a preliminary purge. On the evening before treatment a meal, consisting of bread and milk only, was allowed. The capsules containing the drug were given at six a.m. in the morning and not more than two ounces of water were permitted, to assist in swallowing them. Nothing more was taken until a meal at ten-thirty a.m., and no purgative was given. In fact from our personal experience of the drug and that of a large number of our patients, hexylresorcinol appeared to have a definite cathartic action of its own, its administration frequently being followed by three or four copious watery stools in the course of six or seven hours. These evacuations were not accompanied by the least discomfort or abdominal pain.

We have treated twenty-one cases of ascariasis with a cure rate of 66.6 per cent., and an egg reduction, estimated by the original Stoll counting method, of 94 per cent. In the case of hookworm infection we have treated twenty-six cases with 7.7 per cent. of cures, and 71.4 per cent. of egg reduction. These results compare fairly closely with those quoted above. In the present instance, as on former occasions, we have relied on examination of stools by Lane's centrifuge at least ten days after treatment, in testing for complete cure, and while using the egg-counting method as well, we consider our results by Lane's technique much the more valuable of the two.

We have also treated ten cases of *Tænia saginata* infection, using the same dose and the same method of administration as in the case of round-worm infection. In no case did we recover the complete worm, but five of the cases have reported that they have been free from passing segments for over three months, four have not been cured, and one case has not been traced. These results are not nearly as satisfactory as those reported with carbon tetrachloride by Maplestone and Mukerji (1931). It should also be noted that although the greater part of a tapeworm was usually evacuated a few hours after treatment with hexylresorcinol, the worms were always alive and moved actively when placed in water.

The assumption of the American workers that the percentage of egg reduction may be directly interpreted as a percentage of worm destruction seems to be hardly justified for the worms supplying the eggs in the post-treatment counts are the survivors of severe poisoning to which they have been subjected a short time before, and it seems extremely likely that their functions, of which egg laying is probably the

most important, will be at least seriously upset if not altogether suspended for a considerable time.

Support is lent to this view by a study of the figures in this paper, especially in the case of hookworm, for if we combine our results with those of Lamson, Caldwell, Brown and Ward (1932) we have fifty-one cases with 3.7 per cent. of cures and sixty-seven per cent. in egg reduction. If reduction in the number of eggs were a direct index of the number of worms destroyed one would expect to find a fairly close correlation between the percentage of egg reduction and percentage of complete cures when a large number of cases are taken, and there is no evidence of this in these figures.

One point that has not been touched on by the American workers is the cost of hexylresorcinol. We obtained our supply of the drug from England and it cost us thirty shillings an ounce, *i.e.*, a dose of one gramme cost approximately one shilling, so unless increased demand brings about a great reduction in cost this factor alone will make hexylresorcinol unsuitable for treatments on a large scale. Another serious objection to its use in large scale treatments is the great diminution in efficiency of the drug when given shortly before or after food.

In all the papers quoted above the principal advantage claimed for this drug over other anthelmintics is its safety, and to us this seems to be the only advantage. However, the advocates of this form of treatment themselves admit that dogs may show petechial hæmorrhages in the stomach mucosa after hexylresorcinol, and the superficial layers of the buccal mucosa may be removed by it, so it is clearly not without some injurious action on patients. Another point claimed in its favour is that many times the optimum dose may be given and may be repeated at short intervals without any harm being done.

So far as can be gathered only between two and three thousand cases treated with hexylresorcinol in anthelmintic doses have been reported upon, and it should be remembered that carbon tetrachloride was ushered in with very similar favourable notices only a few years ago, and it was not until after more than forty thousand cases had been treated by Lambert (1922 and 1923), (to quote only one of the early users of this drug) before a death from it was recorded.

In view of the results of treatment given above, the very high cost of hexylresorcinol and the other aspects of the matter which have been discussed we are of the opinion that hexylresorcinol is not yet proved to be an efficient substitute for the older anthelmintics.

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SULPHUR TREATMENT IN MENTAL DISEASES

AN EXPERIMENTAL STUDY OF 100 CASES

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THE use of sulphur injections in general paralysis of the insane was originally suggested by Dr. D. F. Tulunji of Paris in 1925, but Dr. Knud Schroeder of Denmark two years later was the first to put it into practice. Schroeder advocated the use of a 1 per cent. solution of sulphur in olive oil which he called 'Sulfosin Leo' in cases of general paralysis and certain other mental disorders, and published his early results in the *Lancet* in 1929. Since then, a considerable number of English, continental and American observers have recorded their opinion on this therapy in various medical journals. Several papers have since appeared describing the results of this treatment in the columns of the *Lancet* and my first experimental study of 25 cases with this therapy was also published in the *Lancet* (1931). The present article now deals with an experimental study of sulphur injections tried at the Ranchi Indian Mental Hospital over a period of eighteen months on 100 cases suffering from the following mental diseases:—

- (a) Thirty-seven patients of manic-depressive psychosis group.
- (b) Forty-four patients of schizophrenic (dementia præcox) group.
- (c) Eight patients of epileptic psychosis group.
- (d) Two patients of psychoneuroses group.
- (e) One patient with disseminated sclerosis.
- (f) Two patients with chronic epidemic encephalitis lethargica (with Parkinsonian syndromes).

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- (g) Two patients with paranoia or paranoid reactions.
- (h) Four patients with stupor (1 benign and 3 secondary stupor) group.

The Ranchi Indian Mental Hospital is one of the most modern and the largest Indian mental hospital in India and ever since its inception in 1925 I have not yet seen a single case of general paralysis admitted for treatment. General paralysis is admittedly a rare disease in India, consequently I had no opportunity to try sulphur injections in this mental disorder like other observers. Out of the 100 cases selected for this therapy there were 60 males and 40 females. Their ages varied from 17 to 52 years and their stay in the hospital from 6 months to 16 years. Some were of recent admission and others had been in the hospital for several years and had shown no improvement in their mental condition. In assessing the value of any new therapeutical agent it is essential that the patients selected for treatment by this new agent should first be given a fair trial with ordinary treatment. All my cases selected for sulphur therapy had resisted the usual standard routine treatment of the mental hospital, such as rest, diet, tonics, glandular therapy, hydrotherapy, occupational therapy and correction of bad habits and physical defects.

Technique and dosage.—Sulfosin Leo as prepared by Schroeder and manufactured for him by Messrs. Lovens Kemiske Fabrik, Copenhagen, is not obtainable in India so I had to prepare my own solution. I prepare my solution by rubbing up the required quantity of sulphur sublimatum with pure olive oil in a gallipot and heating the suspension in a hot-air oven to a temperature of 90 to 100°C. until all has dissolved. This process of manufacture does not take more than fifteen minutes. After the publication of my first article in the *Lancet* on this therapy the Crooks Laboratory of London informed me that their preparation called 'Collosal Aqueous' which is now obtainable in India gives as good a result as Sulfosin Leo. They also sent me samples of this preparation for trial, and on experiment we found no appreciable difference in the results obtained from 'Collosal Aqueous' and our own freshly prepared solution which costs us next to nothing. I certainly recommend 'Collosal Aqueous' to those practitioners to whom the cost is a secondary consideration and time is money, or to those who do not wish to bother about the home-made preparation of sulphur.

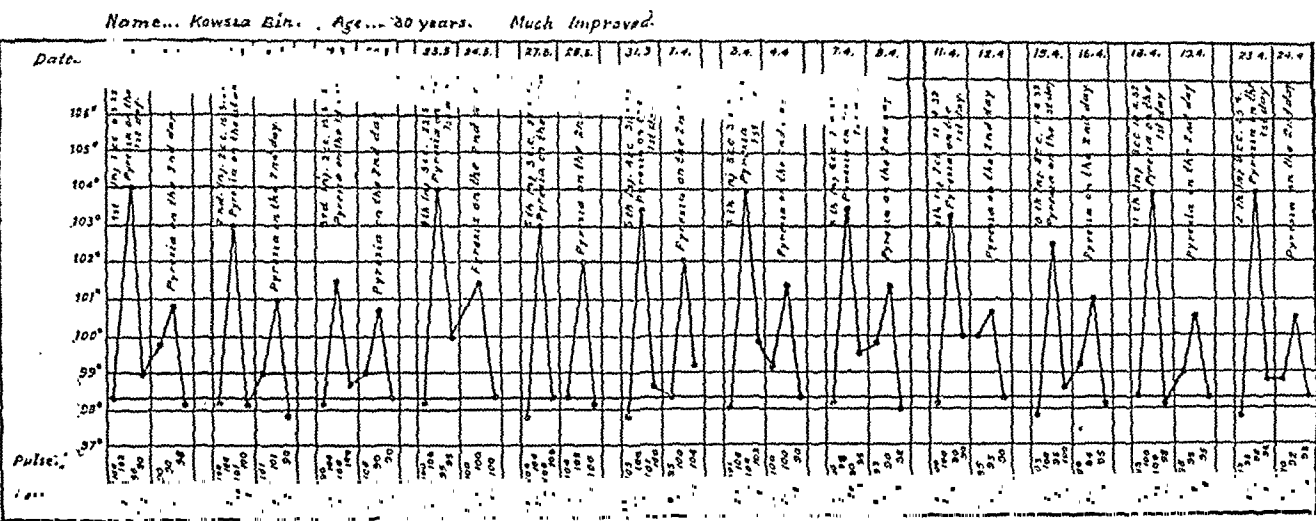
Sites for injection.—The technique followed as regards the actual injection was the same as that originally recommended by Schroeder, viz, to inject the solution suprapariosteally on the lateral side of the femur preferably between the upper and the middle thirds. The next best sites I prefer are the gluteal regions and the outer sides of the arms when the thighs are contraindicated for any diseased condition.

Doses.—I commence the treatment by giving the initial dose of 1 c.cm. and increase the dose by 1 c.cm. at each injection. A course consists of 12 such injections at the rate of 2 per week. The first injection in the course is 1 c.cm. and the last eventually amounts to 12 c.cm., the strength of the solution remaining the same throughout, viz, 1 per cent. The solution should be injected luke-warm and a 3-inch needle is the most convenient size to use. As a rule injections are given at 6 p.m. so that the patients can sleep comfortably at night as the temperature usually rises about 14 to 16 hours after the injection.

Pyrexia.—The reading of temperatures takes place early in the morning and is then taken every half hour until the maximum is reached and then every four hours. The temperature is generally at its height in the majority of cases about 18 to 20 hours from the time of injection and may range from 101°F. to 105°F. with or without rigors. It returns to normal in about 14 to 18 hours. In many cases a secondary smaller rise takes place which comes to normal in 5 to 8 hours. As claimed by Dr. Knud Schroeder I tried to regulate the pyrexia by dosage but did not succeed like many other observers. In some cases I was able to register 104°F. by an injection of 3 c.cm., whereas in others 12 c.cm. did not produce the same result. I suppose individual constitution and idiosyncrasy have a say in this matter and each patient should be studied as to his or her individual capacity for responding to this treatment. The reaction was greater in females than in males. The maximum temperature recorded in my 100 cases was 105°F. and the minimum 100.2°F., the average being 102.1°F. A typical temperature chart is attached herewith. Some patients had nausea and vomiting and a few had rigors. No untoward symptom of a grave nature was ever recorded in my patients during the pyrexial stage except the usual attendant discomfort of pyrexia. The remarkable feature of sulphur injections is the comparatively small disturbance of circulation which is generally associated with such elevations of temperatures. In no case was I able to record a pulse-rate over 120, although the temperature recorded was more than 104°F. Similarly the respiration ratio was approximately normal in all cases. No cyanosis and pallor were noted in the patients.

Leucocytosis.—Marked leucocytosis was noted in all cases. It reached its maximum 22 hours after injection and in a good many cases had returned to normal after 48 hours.

Pain.—The most unfortunate outstanding feature of this therapy I must admit is the pain at the site of injection. Without exception all my patients complained of pain at the site of injection. In the majority of cases it subsides after a few hours but in some it persists for some days. Pain is much relieved by hot



compresses or hot water bags. The degree of pain varies with different patients probably due to individual sensitiveness to this pain. However, I noticed that in the majority of my cases this pain was unavoidable yet bearable.

Results

The following table shows the results of our experiment on 100 cases :—

Number of patients	Types of mental disease	Improved	Recovered	Stationary
37	Manic-depressive psychosis	16	6	15
44	Schizophrenia (dementia præcox)	20	4	20
8	Epileptic psychosis .. .. .	..	..	8
2	Psychoneuroses .. .. .	..	2	..
1	Disseminated sclerosis .. .. .	..	..	1
2	Chronic epidemic encephalitis lethargica (with Parkinsonian syndromes). .. .. .	..	..	2
2	Paranoia and paranoid reactions .. .. .	..	1	1
4	Stupor (1 benign and 3 secondary stupor)	3	..	1
100	TOTAL	39	13	48

I classify my results in the following three categories :—

- (1) Improved.
- (2) Recovered.
- (3) Stationary.

It will be seen from the above table that out of 100 cases 39 improved, 13 completely recovered and were discharged home as cured, and no improvement of any kind whatever was noticed in 48 cases. Of the 39 improved 18 cases have since relapsed and the remaining 21 have still maintained the improvement. One case of benign stupor, who was fed nasally for over a period of 3½ years and was lying in bed throughout the period as apparently dead to this world and had never spoken a word or opened his mouth for drink or food, improved marvellously after the first course of sulphur injections inasmuch as he began to talk although irrelevantly and took his food per mouth. He maintained this improvement for three months and relapsed again and was given

two more courses of injections. He has again improved to the extent that he now takes his food and takes a little interest in his surroundings. This patient also ran a temperature between 101°F. and 102°F. for three weeks after completion of his first course. We failed to trace any cause for this fever, either bacteriologically or physically and the patient complained of nothing. A similar case was reported

by Dr. P. C. Collingwood Fenwick (1931); in his case the patient ran a temperature for four weeks after a course of sulphur injections. Similarly the other two secondary stupor cases who were also fed nasally over a period of more than four months have much improved after the first course of injections and are now able to look after themselves and take an interest in their surroundings. One of them has started work in the garden and the other who is a literate patient and has not looked at a paper or books for months now spends his time in reading books and periodicals and takes an interest in life. The fourth stupor case who was a female patient showed no improvement after three courses of injections. Moreover six patients of the improved class have improved to such an extent that they are fit to be discharged home as cured but as they are criminal patients, they have to undergo their probationary periods according to the Lunacy Act of 1912, hence we cannot discharge them. By

improvement I mean that those patients who were dirty, noisy, destructive, attitudinistic, negativistic, some mute and one, who had hitherto led a purely vegetative existence, improved in their mental conditions inasmuch as they became quiet, clean in their habits and began to take some little and some more interest in their surroundings and many are now attending the occupational therapy department of the hospital to which place they refused to go before. The following table shows the age, sex, the period of stay in hospital and number of courses given to the 13 recovered cases and is self-explanatory:—

the conclusion that if a patient does not derive any benefit by three courses of sulphur therapy he or she is not likely to be benefited by further treatment and we followed this method as a standard routine. In our series of 100 cases,

25 patients had one course.

18 patients had two courses.

47 patients had three courses.

10 patients had more than three courses.

Out of the 39 improved cases,

10 had one course.

9 had two courses.

20 had three courses.

TABLE

Mental disease	Sex	Age	STAY IN THE HOSPITAL			Courses of injections
			Years	Months	Days	
Dementia præcox ..	Female	25	..	4	..	1st course.
Dementia præcox ..	Female	30	..	6	16	1st course.
Manic-depressive psychosis ..	Female	20	..	4	18	1st course.
Dementia præcox ..	Female	18	..	11	20	Two courses.
Manic-depressive psychosis ..	Male	21	..	11	..	Two courses.
Manic-depressive psychosis ..	Male	30	..	4	..	1st course.
Psychoneuroses ..	Male	27	..	9	17	1st course.
Dementia præcox ..	Male	25	3	1	..	1st course.
Manic-depressive psychosis ..	Male	40	..	6	8	1st course.
Psychoneuroses ..	Male	33	1	1	18	1st course.
Manic-depressive psychosis ..	Male	25	..	6	3	1st course.
Manic-depressive psychosis ..	Male	27	1	1	3	1st course.
Paranoid reaction ..	Male	36	..	11	7	1st course.

None of the above discharged patients have yet been readmitted. This shows that they have still maintained the improvement.

Regulation of doses and courses

Doses.—As stated above the increase of dose by 1 c.cm. at each injection need not be followed as a routine in every case. A temperature of 103°F. and over is considered a satisfactory rise for the treatment. Now supposing a patient responds well to a 2 c.cm. dose, it is not necessary to increase the dose to 3 c.cm. at the next injection, but to continue the subsequent injections by 2 c.cm. only until it fails to produce the desired temperature, in that case an increase in the dose is necessary. It will be seen from the attached temperature chart that I have increased the doses when a particular dose has failed to bring about the required rise of temperature. In this case the patient had 12 injections yet the maximum dose never exceeded 9 c.cm.

Courses.—I generally give 12 injections in the first course of treatment and 8 injections for the second and third courses respectively. Courses are given after a lapse of four weeks after the end of each course. Courses are only repeated if the improvement is not satisfactory. In a few cases as an experimental measure we gave more than three courses but the patients derived no further benefit. We then came to

Out of 13 recovered patients,

11 had one course.

2 had two courses.

It will be evident from the above figures that the improvement was very satisfactory and lasting in those cases who improved by the first course. Recovery was also greater and relapses were smaller in number. In the second and third courses 29 improved, 16 relapsed and 2 recovered. It will be seen from the above results that there exists no hard and fast rule as to the doses and number of courses in sulphur therapy, but that each patient has to be judged on his or her individual capacity for responding to this treatment.

Discussion.—It has been a common experience of all psychiatrists that intercurrent febrile illness in the insane sometimes causes amelioration of the mental symptoms and occasionally a spontaneous cure occurs. In my experience of psychiatry work in India and Europe I have seen several cases recovering spontaneously or definitely improved after a severe attack of any infection such as pneumonia, typhoid, influenza, smallpox, measles, etc. How this is effected still remains a mystery in the domain of psychiatry although many have ventured to explain this phenomenon in various ways. Some state that the brain cells thus exposed to hyperpyrexia may be exercising some specific influence, whereas others

state that the fever produces phagocytes and antibodies are stimulated and they attack some hidden source of chronic bacterial toxæmia. On the other hand some suggest that by the fever metabolism is stimulated and in its turn it increases oxidation and hastens elimination of toxic waste products from the brain cortex and body generally. Based upon the frequent reports of psychoses being healed through the intercurrent infections, many investigators have tried various toxic and infectious agents to bring about a cure in mentally-afflicted persons. The substances commonly used have been Koch's tuberculin, all vaccines particularly T. A. B. and *B. coli*, turpentine, milk, blood and blood sera, malaria, sulphur, etc. The induction of fever by inoculation with a view to amelioration of psychosis has recently come into prominence owing to the treatment of general paralysis with malaria. In 1917 Professor Wagner Jauragg of Vienna inoculated 9 cases of general paralysis with tertian malaria, 6 of whom were highly benefited and returned to their homes and resumed their daily work. Of the many reputed pyrexial agents, I have experimented with the following with indifferent results, except sulphur :—

- (1) Malaria.
- (2) Turpentine (fixation abscess).
- (3) T. A. B. vaccine.
- (4) Milk.
- (5) Sulphur.

Recently in Europe and America the production of fever in general paralysis and other psychoses without the introduction of foreign infections is in vogue. This is done by inducing aseptic fever in patients by the super-power diathermy apparatus. The average treatment requires from 6 to 8 hours and must be done under the constant supervision of a trained person who is familiar with its application. A trained operator can manage two cases simultaneously. The technique itself is very simple. The electrodes are placed on the chest, abdomen and on the back so that high frequency electrical energy passes through the body, which offers resistance to this electrical current and the body temperature rises. The essence of the treatment is to keep the patient above 103.5°F. for at least 6 hours. Two treatments are given per week and a course consists of such 8 to 15 treatments. The apparatus ensures complete management and control of temperature as to the limits of its height, duration and extent. In 1930 I had personally seen the diathermy apparatus working satisfactorily in many large mental hospitals of Europe and America. These machines are now obtainable in India but they appear to be very expensive. The mechanism of cure by sulphur has been recently explained by R. P. Mackay of Chicago (1931) who after having experimented with sulphur on animals and human beings tentatively came to the conclusion that the fever is due to the liberation of protein from muscle tissues which

have been damaged by injection of the sulphur or by irritant hydrogen sulphide. He further states that the reaction is more biological than chemical. Mackay concludes that 'Sulphur can accomplish what fever produced by any other method can accomplish and that by virtue of the long duration of the fever produced sulphur should bring results more rapidly and surely than any other method'. Recently a book has been published by Professor K. Bonhoeffer (1931), the eminent neurologist of Berlin, with Dr. P. Josemann. In this book the results obtained with malaria and other fever-producing agents are fully discussed. From 1922 to 1929, 2,000 cases of general paralysis were treated in Berlin by malaria therapy and the authors claim 23 per cent. of cures and 40 per cent. with definite improvement in their cases. Dr. Kellmann in his contribution acknowledges the remarkable success of malaria therapy by the authors, but points out that malaria therapy cannot be pronounced quite harmless and safe as it kills a certain proportion of patients. Dr. Kellmann considers sulphur injections safer and remarks that even if this method is found to be inferior to malaria injection in potency it will nevertheless find a field of usefulness in the treatment of the debilitated for whom more drastic therapy is too dangerous.

Conclusions

1. There can be no doubt that injections of sulphur in olive oil invariably produce a degree of pyrexia. The temperatures obtained range from 100.2°F. to 105°F., the average being 102.1°F., and the temperatures cannot be regulated by doses.

2. Pain at the site of injection in every case was unavoidable but certainly bearable.

3. Sulphur injections should be given unhesitatingly, because unlike malaria therapy they are perfectly safe and can be given to young and old alike. The injections are well worth a trial by any medical practitioner.

4. Earlier cases respond better to treatment than the old chronic cases and the earlier the treatment is instituted the greater is the chance of recovery.

5. I am of opinion that sulphur merits a trial in all early cases of psychoneurosis and psychosis and seems definitely useful in chronic psychotics who have hitherto failed to respond to other methods of treatment. It also appears to be very useful in cases of benign and secondary stupors.

6. Dr. Knud Schroeder of Denmark has undoubtedly shown to the profession the use of sulphur as an unfailing agent for the artificial induction of pyrexia and its distinct therapeutic possibilities.

I would like to express my acknowledgment of the valuable help given to me by the medical and nursing staff of this hospital, as the experiment had undoubtedly thrown an extra

(Continued at foot of opposite page)

TREATMENT AND PROPHYLAXIS OF DRACONTIASIS*

By V. N. MOORTHY, D.Sc., M.A. & B.S.

THE old method of winding the worm is still the common method of extraction adopted in most of the villages. Since the time of Emily, a French naval surgeon who was the first to suggest injection of mercuric perchloride into the worm, various methods of treatment which shorten the course of the disease and obviate the serious risks of the winding method have been tried. As is succinctly put in a proverb 'Ek naru sahasra daru' (one guinea-worm, a thousand remedies), the multiplicity of remedies employed constitutes a strong argument against their utility. Injections of mercuric perchloride solution (strength 1:1,000) have been reported to give good results. On account of the severe local pain and irritation caused by this drug, it is very difficult to induce the villagers to take this injection. I have tried the injection of 1:1,000 acriflavine solution in some cases. After giving 2 or 3 injections at an interval of 2 days into the body cavity of the worm I have found that the worm can be extracted easily. This also gives almost immediate relief to the local itchiness and biting pain, the distressing symptoms so often complained of by the patients. The injection of this drug appears to have an advantage over several other drugs that have been tried so far, in that it does not give rise to any local pain or irritation or to any other systemic disturbances. It is difficult to state whether the good effects of this drug are due to its general antiseptic properties or whether it has any specific parasitocidal action. Experiments show that acriflavine solution, even in a strength of 1:100, does not exert any lethal action on guinea-worm embryos. Such data indicate the absence of any direct parasitocidal action of the drug, but as Dale (1921) has emphasized, specific remedies probably act indirectly *via* the tissues of the host rather than directly on parasitic invaders and in consequence experiments *in vitro* may sometimes yield fallacious results. I may here mention that in some infected villages there is a belief that asafetida taken in small doses along with the food acts as an efficient prophylactic against

guinea-worm infection. In some villages $\frac{1}{2}$ to 1 gr. of asafetida is administered internally with bananas as a treatment for this disease. Experiments also show that a very dilute aqueous solution of commercial asafetida kills the cyclops in the course of a few minutes. But it requires a very strong solution (1 dr. to an ounce) to kill the guinea-worm larvæ. This suggests that there may be something in this belief among the villagers. The asafetida taken along with food perhaps kills the cyclops and also the guinea-worm embryos immediately after they are set free in the gastric juice and thus perhaps acts as a prophylactic. More experiments have, however, to be performed before one can come to any such definite conclusion.

Prophylaxis.—In the absence of a definite specific line of treatment, it is obvious that our efforts should be concentrated on instituting efficient prophylactic measures in the infected areas. These consist mainly—

(1) in rendering patients non-infective by douching the part from which embryos are being discharged, with cold water at intervals, till the uterus of the female worm is empty.

(2) in excluding infective persons from access to sources of water supplies by converting the existing step-wells into draw-wells or by providing the infected place with a safer and a better source of water supply such as a draw-well or preferably a tube-well, and

(3) in killing cyclops in the infected wells by suitable chemical disinfectants.

Of these the ideal prophylactic measure is obviously to convert all the existing infected step-wells into draw-wells or wherever this is not possible to provide the village with a separate draw-well or preferably a tube-well and thus prevent people from using infected step-well water. This is in fact what is being done in some of the infected villages in Chitaldrug district, and in all of them there has been a very noticeable reduction in the amount of guinea-worm infection; and in two villages particularly, by adopting this measure, it has become possible to eradicate the disease practically completely. But since this is a very costly measure, it has not yet become possible to institute it in every infected village.

Of the different chemical disinfectants that have been tried so far it has been found that perchloron (3 lbs. per 100,000 gallons) when used in combination with copper sulphate (1 lb. per 200,000 gallons) gives the best results. The observations, made in the case of four guinea-worm-infected step-wells which were treated with these chemicals, are given in Appendix A. One of them was treated with only perchloron, the other only with copper sulphate, and the remaining two with both copper sulphate and perchloron. Before treating the wells with chemicals, a preliminary count of the number of cyclops present in a definite number of dips, taken by means of a

* From the Department of Health, Government of Mysore, Bangalore.

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burden on their shoulders over and above the daily heavy duties of their office.

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low-net at different parts of the well, was determined. This was done by taking 300 dips from different parts of the well and then actually counting the number of cyclops present in the sample of water thus collected, after killing them by 1 per cent. formalin solution. From this, the number of cyclops per dip was then calculated. Similarly the number of cyclops per dip was determined before and after the well was treated with copper sulphate at first and later with perchloron. Since the largest number of cyclops per dip was got invariably in the evenings, this time of the day was chosen to treat the well with the chemicals. From the observations made so far it appears that perchloron or copper sulphate, when used separately, brings down the number of cyclops in the well to a certain extent; it does not render the well quite free from them. But when they are used in combination, as was done in the case of Kelgote and Thuruvanure step-wells (Appendix A), it is possible to render the well absolutely free from adult cyclops for about a month. Since copper sulphate is a specific poison to algæ and other vegetable organisms on which cyclops mainly feed, it is likely that perchloron exerts a better 'cyclopedocidal' action on water which has been previously treated with copper sulphate, than one that has not been treated so, the half-starved cyclops being then more easily killed by it in the dilution used in the experiment. One great disadvantage however in all the chemical disinfectants that have been tried so far (including those suggested above), is that they do not kill the eggs of the cyclops as effectively as they kill the adults, the result being that the cyclops invariably reappear in the well about a month or two after being treated with such disinfectants. But they are however very valuable in killing the infected cyclops, particularly during epidemics and also during the infective season in the year, i.e., from March to June, and thus reduce the infection with dracontiasis considerably in the infected areas. Since from the experimental observations so far made it has been found that *Barbus puckerellie* fish feed voraciously, not only on cyclops but also on guinea-worm larvæ, a large number of this species of fish have been introduced into the Kelgote step-well after this preliminary treatment with copper sulphate and perchloron. The fish are at present multiplying in enormous numbers in this well and it will be of great interest to see whether this measure will appreciably reduce the number of cyclops in the well permanently and hence also guinea-worm infection in the place, by the fish feeding effectively on cyclops formed from the eggs which remained practically unaffected by the chemicals used in the experiment. It is too early to foresee the future possibilities of this biological method of control of dracontiasis. The following procedure, however, may prove effective in those guinea-worm-infected areas where the

water supply is derived mainly from a big pond or a step-well which does not dry up during summer months, i.e.,—

(i) to render the well at first free from adult cyclops as far as possible by treating it with any of the chemical disinfectants that have been suggested so far, i.e., either by liming the well as suggested by Col. Morison (1930) or by treating the well with a combination of copper sulphate and perchloron, as suggested above, and

(ii) then breed in the well large number of any of the 'cyclopedocidal' fish that are locally available, so that they may feed on the cyclops likely to form from the eggs on which the chemical disinfectants have had little or no effect.

In the selection of any locally available species of fish, it appears to be necessary to select one of which the breeding time is a little earlier than that of the local species of cyclops, so that at the time when the cyclops are multiplying in enormous numbers, there may be a sufficient number of young, recently-bred fish, to feed on the cyclops effectively. The main objection however to the introduction of such a method is perhaps that after some time a biological balance between the cyclops and the fish may be established and as a result both fish and cyclops may live together under certain optimum conditions. In such an event the introduction of a foreign species of fish might help in disturbing this biological balance. At present however, one great difficulty that has been met with in some of the guinea-worm-infected villages is that for some reason or other fresh-water fish of any species do not thrive well in the step-well water. As has been rightly pointed out by Pradhan (1930) this forms a very interesting and an absolutely independent problem by itself and should, I think, be studied in greater detail than has hitherto been done.

In this connection it is of interest to note that during the course of an epidemiological investigation of dracontiasis in Chitaldrug district it was casually learnt that if a handful of bamboo leaves are kept soaked in a potful of infected water used for drinking purposes, this would kill all the cyclops and thus render the water quite safe for drinking purposes. It was also found that in three houses in a guinea-worm-infected area where this custom is being rigorously observed the inmates have successfully prevented themselves against guinea-worm infection for the last fifteen years. It is also a common practice in this village to apply a cold poultice made of young bamboo shoots mixed with a little asafoetida and turmeric to facilitate easy and quick extraction of the guinea-worm. Since this was a very interesting observation an experimental investigation of the toxic effects of the aqueous extract of the different parts of the bamboo plant, particularly of its young shoots, on cyclops, guinea-worm larvæ, etc., has since been commenced and this

APPENDIX A.

Statistics showing the number of cyclops present in the step-wells before and after treatment with copper sulphate and perchloron

No.	Name of the step-well	Date of preliminary observation	Number of cyclops per dip before treating the well with disinfectants				Date on which the well was treated with copper sulphate	Number of cyclops per dip after treating the well with copper sulphate				Date on which the well was treated with perchloron	Number of cyclops per dip after treating the well with perchloron				Date on which the cyclops count was made	REMARKS
			No. of dips	M. 9 a.m.	A. 2 p.m.	E. 6 p.m.		No. of dips	M. 9 a.m.	A. 2 p.m.	E. 6 p.m.		No. of dips	M. 9 a.m.	A. 2 p.m.	E. 6 p.m.		
1	Kelgote step-well	22-5-31	300	12	3	15	23-5-31	300	6	..	13	20-5-31	300	4	5	3	27-5-31	The well was free from adult cyclops for a period of 34 days. Large number of fish belonging to the species <i>Barbus puckerlie</i> have been introduced into the well, since this species of fish has been experimentally found to feed voraciously on cyclops and guinea-worm larvae.
							25-5-31	300	9	5	8			2	3	5	28-5-31	
							26-5-31	300	5	3	6	30-5-31	300	4	..	..	29-5-31
													300	2	..	5	1-6-31	
													300	..	..	4	2-6-31
													300	..	..	..	3-6-31
													300	..	..	..	4-6-31
													300	..	..	..	to
													300	..	..	..	8-7-31
													300	1	..	2	9-7-31	
2	Thuruvare.	18-6-31	300	25	12	58	20-5-31	300	20	9	50	24-5-31	300	6	4	23	25-5-31	Well free from adult cyclops for a period of 29 days. It was found that the species of fish <i>Barbus puckerlie</i> do not live in the sample of this step-well water for more than a fortnight at the most.
								300	22	3	38		300	..	5	20	26-5-31	
								300	15	..	40	28-5-31	300	2	2	10	27-5-31	
													300	..	..	5	29-5-31
													300	..	..	..	30-5-31
													300	..	..	..	1-6-31
													300	..	..	..	to
													300	..	..	..	30-6-31
													300	2	..	7	1-7-31	
													300	3	4	..	8-7-31	
3	Bharmasagar	30-5-31	300	20	28	44	Did not treat the well with copper sulphate					30-5-31	300	10	15	22	1-6-31	Treated with only perchloron. This well could not be rendered free from adult cyclops.
													300	5	12	26	4-6-31	
													300	9	12	30	8-6-31	
													300	6	7	18	10-6-31	
													300	..	4	10	14-6-31	
													300	12	6	18	18-6-31	
													300	7	..	10	20-6-31	
													300	5	2	8	28-6-31	
													300	20	12	13	3-7-31	
4	Chitaldrug	23-5-31	300	35	20	42	3-6-31 3-6-31 3-6-31 13-6-31	300	25	12	29	4-6-31	300	25	12	29	4-6-31	Did not treat the well with perchloron.
								300	16	4	20	8-6-31	300	16	4	20	8-6-31	
								300	14	8	12	12-6-31	300	14	8	12	12-6-31	
								300	6	4	8	14-6-31	300	6	4	8	14-6-31	
								300	10	3	14	18-6-31	300	10	3	14	18-6-31	
								300	28	12	17	6-7-31	300	28	12	17	6-7-31	

work is at present being carried on in the All-India Institute of Hygiene under the guidance of Lieut.-Col. A. D. Stewart, I.M.S. The results of our preliminary observations will be published shortly in the form of a separate paper. The following are among the few observations that have been so far made:—

(i) An aqueous extract of bamboo leaves (*Dendrocalamus strictus*) has a definitely lethal action on cyclops.

(ii) The aqueous extract and also the expressed juice from young bamboo shoots have a definitely lethal action on guinea-worm embryos, cyclops, and also on the eggs, larva and imagines of both mosquitoes and house flies.

(iii) The toxic effect of the young bamboo shoot appears to be due to

(a) the free hydrocyanic acid formed by the decomposition of one of its cyanoglucosides, as the result of enzyme action and

(b) another toxic principle present in the extract, the nature of which is still under investigation.

The practical application of these observations will be discussed in a forthcoming paper. As Leiper has pointed out there still remain for careful study and close observation many interesting problems regarding the prophylaxis of dracontiasis. One can easily realise the limitations of our present knowledge on the prophylaxis of this disease, when it is said that with all the experimental work that has been done on this disease for so many years, the only preventive measure we can advise to the villagers at present is the one enunciated by Manu, i.e., to drink water after straining it through cloth.

I should like to express my grateful thanks to Lieut.-Col. Stewart, I.M.S., for having kindly given me permission to work with him on the larvicidal and other properties of young bamboo shoots, in the All-India Institute of Hygiene. I must also thank Dr. J. V. Karvae, Director of Health in Mysore, for having kindly deputed me to Chitaldrug district for guinea-worm investigation and Drs. A. D. Subba Rao and C. Sree-kantiya for the valuable help given in the course of this work.

Summary

1. For purposes of experimental observation a guinea-worm-infected step-well at Kelgote was treated first with copper sulphate and later twice with perchloron at intervals of 3 days. This measure rendered the well quite free from adult cyclops for a period of about a month. In addition, fish belonging to species *Barbus puckerlie* were introduced into this step-well so that these might feed on any cyclops that are likely to be formed from the eggs on which the chemicals used had little or no effect. It is to be seen whether this measure will reduce the number of cyclops in the well permanently and hence also guinea-worm infection in the place. Laboratory experiments show however that this species

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A NEW VEGETABLE CULTURE MEDIUM MADE FROM THE PAPAIN DIGEST OF MUNG DAL (*PHASEOLUS MUNGO*), GREEN VARIETY

By HUGH W. ACTON, C.I.E.

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THE milky juice of the unripe fruit and also the leaves of the papaya tree (*Carica papaya*, N. O. Passifloræ) are commonly used by cooks in the East to digest and soften tough meat. The papaya tree was introduced into India by the Portuguese during the seventeenth century. We have not been able to find out the exact date when the green papaya was first used in this country. In 1750 Griffith Hughes in his history of the Barbados wrote 'the juice is of so penetrating a nature that if the unripe fruit when unpeeled is boiled with the toughest old salt beef it will make it soft and tender'. Patrick Brown in 1756 reported upon this remarkable meat-digesting property of the juice of the unripe papaya. The method employed by cooks in India to make the toughest meat tender is first to beat the steak well with an iron pestle or a blunt hatchet, and then to wrap

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of fish feed voraciously not only on cyclops but also on guinea-worm larvæ.

2. Weak solutions of asafetida and an aqueous extract of bamboo leaves have a definitely lethal action on cyclops. This property can possibly be made use of in advocating any household prophylactic measures in the guinea-worm infected villages.

3. The aqueous extract and also the juice expressed from the young bamboo shoots have remarkable 'cyclopedocidal', larvicidal, and insecticidal properties.

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the meat round with a papaya leaf, or to add a drop or two of the milky juice immediately before cooking. The meat is then placed in a frying-pan with a little fat and fried over an open fire, when it is considered to be grilled by them.

The first chemical investigation of the enzyme action was carried out by Wurtz and Bouchut (1879, 1880 and 1881). Vines (1901) carefully studied the proteolytic action of papain in connection with his extensive study of the proteolytic enzymes of the plant kingdom. He suggested that there were two enzymes, one like pepsin and another like erepsin. Later, it was found that the peptic enzyme had an optimum activity at 80° to 85°C., and was capable of converting the higher proteins into peptones. There was also a second enzyme like erepsin with an optimum activity at 60° to 65°C., which converted peptones into amino-acids, and probably at the same time broke down the higher proteins. Mendel and Blood (1910) studied the action of papain on the vegetable proteins edestin and excelsin, and in 1915 Deleanu studied the hydrolysis of lupine seeds by papain.

In India the digestive ferment papain, present in the unripe papaya fruit and in the juice, should be the enzyme of choice to hydrolyse proteins, when these digested foods are to be given orally. There are religious scruples against using an enzyme derived from animals, such as pepsin from the pig and trypsin from the cow. Papain can digest the higher proteins into amino-acids without any alteration in the pH of the substrate, such as is required for peptic and tryptic digestion. The next difficulty that occurs in India is with Martin's veal broth, which is made from the calf and is objected to on religious grounds by the Hindus. This veal broth is recommended for the manufacture of bacteriophage. To overcome this objection Morison first suggested the use of a papain digest of mutton for the preparation of bacteriophage. Martin (1927) published a short paper on the subject, and later papers on the manufacture of papain-mutton-broth were published by Morison and Vardon (1929) and Morison (1931). The ease with which one can prepare the papain digest of mutton compared

with Martin's veal broth has made the former medium a popular one for the preparation of bacteriophage on a large scale in India.

Objections have been raised against the use of meat broth by orthodox Hindus who are strict vegetarians and prefer not to take orally any meat extract if it can possibly be avoided, whilst there are sects in India who prefer their cattle to be killed in an orthodox way by *halal* or *jhutka*. To overcome any possible objection that may be raised by these various sects in India against the use of meat extracts in the preparation of bacteriophage, we decided to investigate the possibility of obtaining the necessary amino-acids from plant proteins by papain digestion. We considered that the amino-acids derived from plant proteins would be more easily assimilated by the bacteria than the amino-acids derived from animal proteins. Moreover, at the same time, these amino-acids derived from plants would be less inhibitory to the multiplication of the bacteriophage. Media containing infusions or digests of plant derivatives of unknown composition have from time to time been used either alone or in combination with additional material of animal origin; thus the Bordet-Gengou medium contains starches and proteins of potatoes in addition to animal proteins. As far as we know no experiments have been recorded with digests of vegetable proteins of more fixed chemical composition such as the lentils or dāls.

Selection of the lentils (or dāls).

The vernacular name *dāl* includes the following dry lentils and peas which are rich in plant proteins, cheap in price, and available in any Indian market. We selected the following varieties of dāls for our experiments:—

1. *Phaseolus mungo* (Mung dāl).
2. *Ervum lens* (Musur dāl).
3. *Cicer arietinum* (Channa dāl), chick pea or gram.
4. *Cajanus indicus* (Arahar dāl).
5. *Pisum sativum* (Matar dāl), dried peas.

The chemical composition of these lentils have been investigated and we give the following table which has been extracted from Stewart, Boyd and Dey's paper (1931):—

TABLE I

Dāl	Protein	Carbohydrate	Fat	Moisture	Ash
Mung ..	25.95	59.88	1.75	8.70	3.72
Musur ..	24.69	63.77	1.08	8.51	1.95
Channa ..	20.57	....	6.35	....	2.15
Arahar ..	22.78	....	1.52	....	3.94
Matar ..	22.28	64.91	1.96	8.17	2.68
Meat* (average)	18.00	....	19.4	60.00	0.96

* Sherman's table as quoted by Hawk (1926).

It will be noted from the above table that the protein content of the lentil—*Phascolus mungo*—is higher than the protein contents of the other dāls, and a good deal higher than meat. The different dāls were digested under identical conditions. The temperature and duration of the digestion, the relative proportions of the dāls and papain were varied and the different species of broth tested to determine which of the dāls yielded the best broth. This was judged by the freedom from colouring matter, the transparency, and the amino-acid content of the broth. Finally, the growth of the different intestinal micro-organisms were tested upon these different dāl media, using the following media as controls :—

(1) Peptone water, (2) Difco bacto-peptone 1 per cent., and (3) papain digest of mutton containing 0.5 per cent of oxidisable matter. The different media tested showed that the papain digest of mung dāl was by far the best for the growth of intestinal organisms and the preparation of bacteriophage.

The technique for preparing the mung dāl papain broth

Mung dāl according to Watt's *Dictionary of the Economic Products of India* is one of the four pulses which resemble each other very closely in appearance and in habits of growth, the other three being moth (*Phaseolus aconitifolius*), lobia (*Vigna catiang*), and urd or mash (*Phaseolus mungo* variety *radiatus*). There is a certain amount of difficulty in recognising the difference between mung and its subvariety mash. The most popular distinction between these two pulses growing in the field is that mung has dark green leaves and that mash has yellow green leaves, but the chief difference is in the size and shape of the grains. The mash grains are larger and longer than the mung. Mung dāl has three colour varieties; the green seed is the typical and commonest variety, called *hara mung*; the yellow seeds, *Phaseolus aureus*, are known locally as *sona mung*—*sona* meaning gold; whilst the black seeds *Krishna mung* have been described by Roxburgh as a distinct species under the name of *Phaseolus max*. The mung we used to prepare the broth was *Phaseolus mungo* (the green variety). The reason we chose the green mung dāl was that it is considered to be the most easily digested dāl and is recommended as a food for invalids; it is considered to be 'cooling' and an astringent in its properties. On the other hand *Phaseolus radiatus* (mash) is less digestible but 'heating' and strengthening.

The technique for the preparation of the mung dāl broth, using papain as a digestive ferment, is as follows :—

The composition of the medium

Water—5,000 c.cm.

Mung dāl (powdered green variety)—500 grammes.

Papain (Cawnpore—activity 50 per cent.)—5 grammes.

Sodium chloride in sufficient quantity to make the broth contain a 0.5 per cent. solution of the salt.

The mung dāl is powdered up in a pestle and mortar or more conveniently in a mechanical grinder. Five hundred grammes of this powdered dāl is mixed thoroughly in five litres of water. Five grammes of papain, which we obtained from the Harcourt Butler Institute, Cawnpore, is first made into a thin paste with a little water and added to the mung dāl mixture and then thoroughly mixed. The digestion was carried out in a water-bath at a temperature between 60° to 65°C. for four hours, and during this time the mixture was frequently stirred. We have found that at this temperature the amino-acid digestion is most complete, and the starches are not set free. At the end of four hours the mixture is strained through a fine muslin cloth, and the volume is made up to five litres by the addition of water. The reaction is now adjusted so that a faint alkalinity appears on the addition of ammonium hydrate solution as judged by the appearance of a light red colour, using phenolphthalein as an indicator. The whole medium is now filtered through filter paper. Sterilisation is carried out in the autoclave by heating the broth for 30 minutes at 121.6°C. or 15 pounds pressure. This makes a concentrated broth and also destroys the enzymes. The oxidisable matter is determined by the permanganate method in terms of milligrammes of oxygen required per 100 c.cm. of the concentrated broth. This concentrated broth usually contains oxidisable matter varying between 1.8 to 2.2 per cent. The broth is now diluted with water so as to contain 0.5 per cent. of oxidisable matter. Sodium chloride is added to give a concentration of 0.5 per cent. in the diluted broth. The reaction is now adjusted to a pH of 8.4 which is suitable for most of the intestinal organisms. At the time of adjustment there is a deposit of phosphates. The broth is now filtered through filter paper and should be perfectly clear. The reaction can be readjusted to neutrality if it is required for other types of organism. The broth is distributed into tubes or flasks and sterilised for 20 minutes at 115°C. In the preparation of solid medium a concentrated broth diluted to contain 0.75 per cent. of oxidisable matter is used, and agar added in the usual proportion to solidify the medium.

Notes on the method of preparation of mung dāl medium

The use of caustic soda to adjust the reaction of the broth has the effect of imparting a dark colour to it. Martin (1927) noted this effect of caustic soda in the preparation of mutton broth with papain, especially if an excess of papain has been used in its preparation. Discoloration of the medium, we found, could be

prevented by the use of ammonia. The optimum temperature for the activity of papain varies; at 80° to 85°C., digestion is very rapid occupying about half an hour and the proteins are split into peptones, but there is also considerable difficulty in straining and filtering the digested mass in the case of dāl. At a lower range of temperature, 60° to 65°C. digestion is much slower and it takes four hours to accomplish, but the proteins are converted into amino-acids. At the lower optimum temperature, the starch granules are not broken down, and so do not pass into the broth. The digest is easily filtered so that a very clear broth is obtained for use. The test for the amino-acid digestion is done by using the bromine water test for tryptophane, the reaction becomes positive after two hours digestion and reaches its maximum after four hours. A well-marked cholera-red reaction can be obtained after 24 hours by growing the cholera vibrio in this broth. The broth as prepared above was found to be free from all traces of starches and usually sugar could not be detected, even after the broth had been hydrolysed with hydrochloric acid. Benedict's solution was used for the test to see whether the broth was free from sugar. The amino-acid content of the finished broth, i.e., diluted broth containing 0.5 per cent. oxidisable matter, was found to vary from 3.4 to 4 c.cm. expressed in terms of neutralisation with N/20 NaOH. This compares favourably with the amino-acid content of broth prepared from mutton digested with papain. We also isolated from the mung dāl a more or less pure protein fraction, but we found that the broth made from the proteins was in no way better than the broth prepared from the whole mung dāl. The isolation of protein from the dāl is a very tedious and laborious process so we abandoned the method as it had no advantages over the use of the whole dāl.

Bacterial tests to study the suitability of the mung dāl medium

In India a great deal of the work in bacteriological laboratories is concerned with the growth of the various intestinal organisms. For this reason we selected the following organisms, i.e., cholera and cholera-like vibrios, *B. typhosus*,

B. paratyphosus A and B, *B. dysenteriae* (Shiga), *B. dysenteriae* (Flexner) and *B. coli* to test the value of the medium. The medium is very clear and transparent so that we found that it is easy to differentiate the smooth and rough colonies of these organisms. Moreover one could more easily recognise the different colonies seen in mixed growth as obtained from faeces on this medium than in other medium. The bacterial colonies on the mung dāl medium were larger than those on the 0.5 per cent. bile salt McConkey's plate. One has no hesitation in saying that the mung dāl medium is better than the ordinary broth medium for these intestinal organisms.

The next point we studied was the growth of the bacteriophage on the different organisms when grown in the mung dāl medium and in papain mutton broth cultures. Lysis takes place as rapidly and as completely as in the case of the mutton broth medium and the phages were found to be as active when grown on the bacteria in mung dāl medium as compared with those grown on the bacteria in papain mutton broth.

The next test we carried out was the cultivation of ten common fungi obtained from the mycological department of the school. The following fungi were grown on this medium:—

Actinomyces keratolytica, *Trichophyton violaceum*, *Tinea cruris*, *Microsporum audouini*, *Achorion schonleini*, *Actinomyces asteroides*, *Monilia* from the tongue, *Sporotrichium beurmanni*, and *Aspergillus*.

Within ten days there was a good growth with all the fungi, in spite of the fact that the pH of the medium was 8.4 instead of 6. The colonies grew well with aerial hyphae and the deep roots could be seen penetrating the medium when the culture tube was viewed laterally. The medium appears to be extremely useful for the cultivation of these higher fungi. We have now to test the value of the medium for growing delicate organisms belonging to the genera, *Hæmophilus*, *Nisseria*, and other organisms that require the addition of blood to the medium. So far we have found that streptococci of the *faecalis* type grow well on the medium.

TABLE II

Medium	Raw material used in grammes	Papain used in grammes	Water used in litres	Oxidisable matter. (Approximate).	Volume of the finished broth containing 0.5 per cent. oxidisable matter	Cost per litre
Peptone ..	500	..	50	0.5 per cent.	50 litres	12 annas
Papain—meat ..	500	7.5	2	1.5 „ „	6 „	4 „
Papain—dāl ..	500	5.0	5	1.8 to 2.2 per cent.	20 „	½ anna

These prices are exclusive of overhead charges.

Finally, when we consider the cost of the medium we find that it is extremely cheap. Thus, for 1 per cent. peptone water, taking the cost of Witte's peptone to be Rs. 28 per pound and Difco to be Rs. 44 per pound, the cost of a litre of peptone water works out at 12 annas to a rupee. With papain mutton broth the cost in India varies between three to five annas per litre, as the cheapest mutton costs about six annas per pound. The mung dāl medium costs a quarter of an anna per litre as mung dāl is only three to four annas per seer, i.e., two pounds. The details of the cost of preparation are shown in table II.

Conclusions

(1) A method is described for preparing a pure vegetable cultural medium, by digesting green mung dāl (*Phaseolus mungo*) with papain at a temperature of 60° to 65°C. for four hours.

(2) The mung dāl broth has given better results in the cultivation of the intestinal bacteria and bacteriophage than mutton broth or peptone water. Solid media made from this dāl broth give a very good growth of the intestinal organisms as well as of the higher fungi.

(3) Mung dāl broth is a pure vegetable medium and is not open to any of the objections that a medium containing meat or one digested by animal enzymes would have, from a religious point of view. In the East this broth can therefore be given orally without offending the religious scruples of the people.

(4) The materials required for the preparation of mung dāl broth are readily obtainable and the cost of production is considerably less than the cost of the other media used in the preparation of bacteriophage.

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CONSTANTS OF PURE BUFFALO *GHI*

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Legal standards in Bengal.—In 1930 we analysed in the Calcutta Public Health Laboratory 572 samples of buffalo *ghi* sent by the local authorities under the Bengal Food Adulteration Act of 1919. According to the standards prescribed by Government under Section 4 of the Act, buffalo *ghi* to be certified as genuine should have the following standards

Butyro-refractometer reading	
at 40°C., Zeiss scale	.. 40 to 42
Reichert-Wollny value	.. 30
Saponification value	.. 222

Now, out of these 572 samples, 319 or 55 per cent. gave Reichert-Wollny values ranging between 30 and 39 and were of course certified as genuine. But of the remaining 253 samples, while 100 had the values of this constant at 15 or less and so were undoubtedly adulterated,

108 or 18.8 per cent.	gave the value at 27,
34 or 5.8	" " " " 24, and
11 or 1.9	" " " " 21.

In a previous paper (1927) we saw that 8 out of the 51 samples of cow *ghi* prepared by ourselves, i.e., about 16 per cent., had Reichert-Wollny values below 24, and a butyro-refractometer reading at 40°C. from 44 to 45, while the legal standards for these constants of the genuine cow *ghi* were 24 and 40 to 42 respectively; and we remarked that these 16 per cent. of genuine samples of cow *ghi*, each prepared from the milk of a separate cow, would have been condemned as adulterated under the standards of the Act and that such risk, though exceedingly small in the case of market *ghis* which were blends of *ghis* from several cows, could not be ignored. Could the same remarks apply to the empirical standards laid down for buffalo *ghi*?

Genuine buffalo ghi.—With a view to testing the standards for buffalo *ghi*, we prepared the *ghi* ourselves from the milk of individual buffaloes according to the process of the local milkmen, just as we did in the case of the cow *ghi*. We made altogether 51 samples, viz, 27 in 1927 and 24 in 1930 and examined them duly after their preparation.

Analysis.—The analysis was done in duplicate and I am much indebted to my assistants Messrs. P. B. Mandal and A. C. Das Gupta for the help I got from them. The values of the

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constants of the *ghis* of the two years were as follows :—

67 samples, each sample in both cases being prepared from a separate individual buffalo.

Years	Analysed by	Number examined	Reichert-Wollny value	Refractometer reading at 40°C. Zeiss scale	Saponification value	Iodine value
1927	P. B. Mandal ..	27	24.5 to 38.5	43.7 to 39.0	219 to 237.6	39.3 to 23.4
1931	A. C. Das Gupta	24	20.9 to 37.5	44.5 to 40.2	213 to 231.8	40.4 to 27.7
	TOTAL ..	51	20.9 to 38.5	44.5 to 39.0	213 to 237.6	40.4 to 23.4

Results

(1) *Value of the constants.*—It is butyric acid which is as characteristic of buffalo *ghi* as of cow *ghi*, and the Reichert-Wollny value, though empirically, represents this characteristic. Of the other constants, we find from the table of the constants given below that the saponification and refraction values found by us in our samples have a correlation with the Reichert-Wollny values which is practically complete and that the correlation of their iodine values to the Reichert-Wollny values is also very high, *viz.* :—

Chance of a sample of genuine ghi from the market falling off from the legal standards.—*Ghi* bought in the market is as a rule the blend of the products of milk of several buffaloes and not of separate single animals as in our experiment. The values of the constants of such *ghis* are the average of those of the *ghis* from the milk of those animals. We have seen that the Reichert-Wollny value of the *ghis* from the milk of our 51 animals ranged from 21 to 38, with the average or arithmetic mean at 31.4. As the standard deviation is 4, the probable error of the average is only 0.4. So we may

Constant	VALUE		CORRELATION TO REICHERT-WOLLNY VALUE	
	Range	Average	Correlation coefficient	Regression factor
Reichert-Wollny value	21 to 38	31.4	.. ..	.. ..
Saponification value	213.6 to 237.5	226.9	+ 0.93 ± 0.01	+ 1.17
Refractometer reading at 40°C. ..	39.0 to 44.5	41.7	— 0.93 ± 0.03	— 0.28
Iodine value	40.4 to 23.4	31.0	— 0.86 ± 0.02	— 0.93

Working from the above data we find :—

Saponification value = $226.9 + 1.17 \times (\text{R. W.} - 31.4)$

Refractometer reading at 40°C. = $41.7 - 0.28 \times (\text{R. W.} - 31.4)$

Iodine value = $31.0 - 0.93 \times (\text{R. W.} - 31.4)$

The following table compares the values of the constants actually found with those calculated from the correlations.

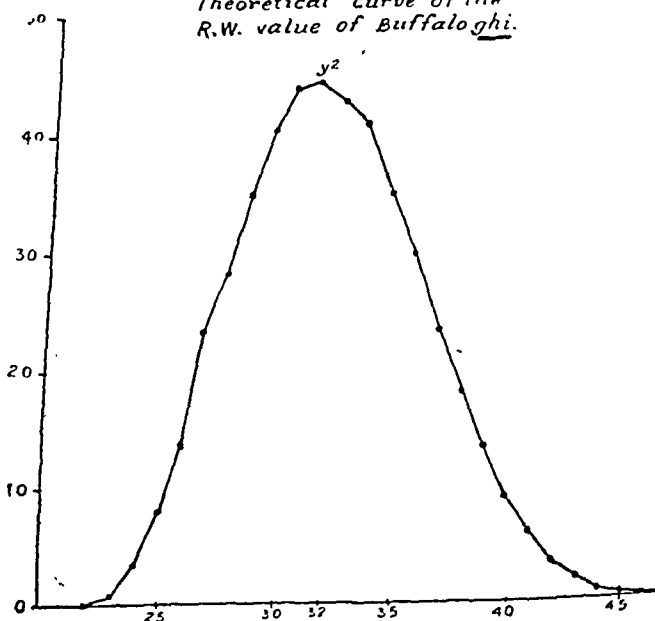
The errors of the values calculated, *i.e.*, their departure from the actual values, as will be found from the table, are—

For saponification value — 5.5 to + 4.9
For refraction reading at 40°C. — 1.4 to + 0.7
For iodine value — 3.4 to + 6.3

(2) *Samples with constants below standards.*—Thirteen samples out of the 51 had Reichert-Wollny values of 29 and less. Their refractometer readings were also higher than 42: only 3 of them had saponification values of 222 and over. So that at least 20 per cent. of these samples did not pass the standards of any of the legal constants. This is in complete variance with the results obtained in the Calcutta Municipal Laboratory; the Reichert-Wollny values obtained by Drs. J. Dutta and S. B. Ghosh (1908) were 30.5 to 39.3 in 40 samples, and by Dr. T. K. Ghosh (1920) were 30.0 to 40.0 in

GRAPH.

Theoretical curve of the R.W. value of Buffalo ghi.



fairly assume these 51 buffaloes as representative of the generality of buffaloes as the fifty cows in my previous paper on constants of pure cow *ghi* were representative of the generality

TABLE

Reichert-Wollny value	SAPONIFICATION VALUE		REFRACTION READING AT 40°C.		IODINE VALUE	
	Actual	Calculated	Actual	Calculated	Actual	Calculated
20.9	213.6	214.6	44.5	44.6	40.4	40.8
24.5	220.3	218.8	43.2	44.6	36.6	37.4
24.5	219.2	218.8	43.3	44.6	37.6	37.4
25.6	219.9	220.1	43.7	43.3	39.3	36.4
25.9	225.4	220.5	43.6	43.2	38.8	36.2
26.6	220.4	221.3	43.7	43.0	32.1	35.5
26.6	219.1	221.3	43.4	43.0	37.1	35.5
26.9	221.0	221.6	42.7	43.0	35.3	35.3
27.5	221.6	222.3	43.2	42.8	33.2	34.6
27.9	220.7	222.8	42.7	42.7	35.8	34.3
28.0	223.4	222.9	42.7	42.6	33.7	34.2
28.2	222.4	223.1	42.6	42.5	33.7	34.0
29.0	221.6	224.1	42.8	42.4	34.9	33.2
29.4	224.6	224.5	41.8	42.3	39.2	32.9
29.4	224.0	224.5	42.7	42.3	34.7	32.9
29.6	224.8	224.8	42.5	42.2	34.0	32.7
29.9	225.9	225.1	42.4	42.1	32.9	32.4
30.0	224.3	225.2	42.2	42.1	32.7	32.3
30.0	225.9	225.2	42.1	42.1	34.6	32.3
30.0	227.2	225.2	41.8	42.1	31.5	32.3
30.2	225.0	225.4	42.3	42.0	31.9	32.1
30.4	226.9	225.7	41.5	42.0	31.4	31.9
30.5	224.2	226.8	42.3	41.9	32.9	31.8
32.1	227.1	227.7	41.6	41.5	30.4	30.4
32.2	228.5	227.8	42.2	41.5	35.4	30.3
32.3	227.0	227.9	41.9	41.5	32.2	30.2
32.3	227.5	227.9	42.4	41.5	34.3	30.2
32.3	228.9	227.9	41.3	41.5	28.3	30.2
32.4	229.1	228.1	41.3	41.4	31.6	30.1
32.4	224.9	228.1	41.3	41.4	30.3	30.1
32.5	230.6	228.2	41.4	41.4	29.2	29.0
32.6	232.3	228.3	40.8	41.4	26.9	28.9
32.9	228.7	228.6	40.6	41.3	30.6	28.6
32.9	228.9	228.6	41.2	41.3	27.9	28.6
33.2	231.3	229.0	40.5	41.2	26.9	28.3
33.7	229.8	229.6	40.9	41.1	27.6	27.9
33.9	229.2	229.8	41.6	41.0	32.9	27.7
34.1	230.6	230.1	41.1	40.9	29.0	27.6
34.3	..	230.3	40.1	40.9	26.1	27.5
34.4	232.0	231.0	40.0	40.9	26.2	27.3
34.9	233.0	231.2	39.9	40.7	25.2	26.8
35.1	229.9	231.2	41.3	40.7	29.8	26.7
36.0	226.8	232.3	41.0	40.4	25.2	26.7
36.5	231.1	232.9	40.2	40.3	29.8	26.3
36.8	229.5	233.2	40.5	40.2	28.3	25.8
37.2	231.5	233.7	41.0	40.1	28.9	25.6
37.4	233.0	233.9	40.0	40.0	26.3	25.4
37.8	237.5	234.4	39.4	39.9	24.9	25.1
38.1	230.2	234.7	40.1	39.8	27.4	24.8
38.3	237.6	235.0	39.4	39.8	24.7	24.6
38.5	236.9	235.2	39.0	39.7	23.4	24.4

of cows. As the ratios of the moments of the curve of these Reichert-Wollny values give a critical function = -0.05, the curve is of the Pearson's type 1 with the skewness = 0.286.

Total range = 30.8.

Range on one side of the origin of the curve (l_1) = 11.64, i.e., from 19.16.

Range on the other side (l_2) = 19.16, i.e., to 49.95.

The mode = 32.

The graph of the theoretical curve for the Reichert-Wollny values on the above calculation is given on the previous page.

Obviously the chance of the value departing from the range of 29 to 35 rapidly diminishes as the number of animals increases, and it

practically disappears even when the *ghi* is derived from milk of only ten animals.

Conclusions

In condemning a sample of *ghi* as adulterated in our certificate under the Food Adulteration Act, we need not forget that the sample may have been derived from the milk of one animal or from that of two or three. But that is far from any reason for lowering the standards, such a step would be disastrous to the intention of the Act.

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A Mirror of Hospital Practice

THREE CASES OF PLAGUE TREATED WITH 'BAYER 205'

By B. R. RANGANATHA RAO, L.M.P.

Sub-Assistant Surgeon, L. F. Dispensary, Vadighalli

MAJOR G. W. VINCENT, I.M.D., retired, reported four cases of plague successfully treated with 'Bayer 205' in the *Indian Medical Gazette* for March 1931. I tried the remedy in the three following cases. The cases occurred in the middle of an epidemic.

Case 1.—S., aged 30 years, a Hindu female; ill for three days. I saw her on 31st January, 1932. Temperature—103°F., pulse 135, easily compressible. Low muttering delirium; perspiration on the head and face. There was a tender enlarged bubo in the left groin; she was given 0.9 gramme of 'Bayer 205' in 10 c.cm. of distilled water. The temperature came down to 100°F. next morning and was normal by the same evening. The patient was well and walking about in a week, the bubo having disappeared on the sixth day of her illness.

Case 2.—P., aged 32 years, a Hindu female, illness of five days; she was taken ill on 17th February, 1932, and I saw the patient on the 22nd February. Temperature—102.5°F., pulse 130, and soft, semi-comatose, breathing laboured, lying in her bed with the right thigh semi-flexed. The eyes were much congested; she could be raised only after much shouting and had a bubo in the right groin which was very painful and tender. She was given one intravenous injection of 0.9 gramme of 'Bayer 205' in 10 c.cm. of distilled water. The temperature came down to 99°F. within thirty-six hours, the glands subsided, and the patient was attending to her usual work within a week.

Case 3.—C., a Hindu female, aged 26 years. I saw her on 2nd March, 1932, at 3 p.m. on the fourth day of her illness. Temperature—104.5°F. Pulse rapid and weak about 145 per minute. Unconscious and no food was given for 24 hours; eyes blood-shot, with left side of the neck swollen and tender below the left ear, where there were two buboes, each about the size of a seed of a jack fruit, and very tender. Breathing was rapid, the patient very restless and rolling in the bed. She was given intravenously 0.9 gramme of 'Bayer 205' in 10 c.cm. of distilled water. She was given a soap water enema for her five days constipation. There was no improvement on the 3rd; but on the 4th March, 1932, she was conscious and had no fever, the tenderness in the glands had decreased; but she complained of pain when swallowing food. On the 7th March, 1932, the glands had subsided and she took ten more days to recover sufficiently to walk about.

All the three cases were uninoculated against plague.

The only other treatment given was application of belladonna pigment to the buboes and stimulants internally.

The number of cases treated by me is small, but taken in conjunction with Dr. Vincent's four cases and those of Dr. Dyce Sharp, reported in the February 1926 number of the *Transactions of the Royal Society of Tropical Medicine and Hygiene*, there seems to be no doubt of the good results from the use of 'Bayer 205' in bubonic plague.

A CASE OF DYSPHAGIA DUE TO ROUND WORMS

By Y. SURYANARAYANA ROW, L.M.P. & L.T.M.

Government Royapuram Hospital, Madras

A YOUNG man, aged about 18 years, was brought to me in February 1928 complaining that he had lost the power of swallowing either solids or liquids for the past three days. Except this there was no other sign or symptom.

On examination I found the patient weak and exhausted, having been starving for the previous three days. Pulse and respirations were normal except the former was a little feeble on account of his weak state. Nothing abnormal could be found in heart and lungs. He had been constipated for the previous six days. The patient was quite conscious and the power of speech was normal though feeble.

I poured about a dessert-spoonful of chloroform water into his mouth and asked him to swallow. In spite of any amount of persuasion on my part and repeated trial on his part, he could not swallow this small quantity of liquid and after some ineffectual attempts, the fluid came out of the corners of the mouth. Much less could he swallow any solids. Then I tried to pass a stomach tube to see whether the patient had any obstruction in the œsophagus due to a foreign body, growth, or stricture. On account of the restlessness and non-co-operation on the part of the patient, I could not pass the tube. I put the patient under chloroform anaesthesia and then passed the stomach tube easily. I found the stomach quite empty and I washed it out with weak sodium bicarbonate solution and in the end put in one ounce of magnesium sulphate in solution and kept the patient at rest. In about three hours I was informed that the patient had three loose watery motions in one of which he passed one round worm. Considering that round worms might have probably been the cause of his present trouble, I gave five grains of santonin the same night followed by castor oil, one ounce, the next morning. All these were administered through the stomach tube, as well as feeds of milk at intervals. The next day the patient passed thirty-two round worms and after that the power of deglutition slowly returned. He was then able to take only fluids in sips and not more than a dessert-spoonful each time. The third day he passed another lot of round worms about fifty-four in number and continued to pass them for a week until the total came up to one hundred and forty-eight. After that he did not pass any more worms, though I repeated the administration of santonin a second time. By the end of one week his power of deglutition was quite normal. It was only during the first four days that he had to be fed through the stomach tube. He made an uneventful recovery afterwards.

Undoubtedly the cause of obstruction was the round worms either from their

mechanical obstruction coiled up in a mass at the lower part of the œsophagus, and this mass might have been pushed down by the stomach tube, or more probably the cause was the reflex irritation caused by the worms, producing spasmodic contraction of the œsophagus. Had it been the former, i.e., mechanical obstruction, the patient would have been able to swallow easily when I passed the stomach tube on the first day, but the dysphagia continued for four days, so I think the latter cause is the more probable.

A CASE OF BRODIE'S ABSCESS

By M. A. RAHMAN

LIEUTENANT-COLONEL, I.M.S.

Civil Surgeon, Agra, and Superintendent, Thomason Hospital

and

VANAMALI S. MANGALIK, M.D.

Resident Medical Officer, Thomason Hospital, Agra

A HINDU widow, aged 18 years, came to the hospital complaining of pain and swelling round about the right knee joint for the last two years.

The knee joint was swollen; the swelling being more marked at the upper end of the tibia, and in the popliteal fossa. The part was tender as a whole, but most intensely so on the outer side of the condyle of the tibia. There was a sinus, situated on the outer side of the upper end of tibia, about 1½ inches long, leading to a cavity in the upper end of that bone and discharging thin yellowish-white pus. Bare bone could be felt by probing the sinus.

The popliteal fossa was full, being both hot and tender, and fluctuation could be elicited. There seemed no direct connection between the swelling in the popliteal fossa and the sinus in the bone. On exploration with a needle, the fossa was found to contain yellowish-white pus.

The general condition of the patient was not good. She looked run down and anæmic, and was running a low continuous type of temperature. There was wasting of the muscles of the affected extremity, and œdema of the right foot and ankle. The patient had been so miserable during the last two years that she was insisting on an amputation.

She had no cough or history of hæmoptysis, and her lungs did not show any sign of disease; nor was there any sign or symptom to indicate disease of the gastrointestinal tract.

There was no enlargement of glands anywhere in the body.

Nervous system was normal.

Blood examination did not reveal any gross abnormality.



Positive of the skiagram of the right knee joint, external lateral and internal lateral views.

The swelling had come on gradually. She did not remember having had an injury in that region. She had a continuous mild dull pain, and would not allow the knee joint to be moved, which she kept in a semi-flexed position.

Total white blood corpuscles ..	12,000 per c.mm.
Total red blood corpuscles ..	3,500,000 " "
Differential white blood corpuscles—	
Polymorphonuclears ..	80 per cent.
Large mononuclears ..	1 " "
Lymphocytes ..	18 " "
Eosinophils ..	1 " "

Wassermann reaction—Completely negative.

Culture of pus aspirated from the popliteal fossa showed pure growth of *Staphylococcus aureus*.

Urine examination did not show any abnormality.

Radiogram of the right knee joint, internal and external lateral views, showed—'..... localised necrosis of the upper end of tibia. There is slight sclerosis round the lower part of the necrosed area. The knee joint appears to be free. The picture is one of Brodie's abscess, with a sequestrum in the abscess cavity'.

Treatment.—The patient was operated upon under chloroform. A vertical incision, about $2\frac{1}{2}$ inches long, was made in the region of the sinus, down to the bone. The skin and fascia were retracted. The sinus in the bone was enlarged by chiselling, and the abscess cavity was laid open fully. Pieces of necrosed bone, three in number, were found lying loose and were removed. The abscess cavity was found to be the size of a large egg. The walls of the cavity were scraped, and the wound was dressed with the following solution:—

Acriflavine ..	..	1 part.
Methylated spirit ..	..	400 parts.
Liquid paraffin ..	..	2,000 parts.

The abscess in the popliteal fossa was opened by a medial incision, and counter opened in the popliteal fossa. The patient made a rapid recovery after the operation. Her temperature dropped to normal the following day, and the oedema from her right foot and ankle disappeared within a week. Slowly and steadily, she put on weight. The anæmia is better and the wound is steadily healing.

Our thanks are due to Dr. A. B. L. Mathur, Radiologist, Thomason Hospital, for his kind help.

A CASE OF ERYSIPELAS

By C. D. TORPY, I.M.D.

Assistant Medical Officer, B. B. and C. I. Railway, Sirsa

I was playing tennis one evening, when one of the tennis scouts hit his foot against a sharp stone and sustained a gash on the dorsum of his foot. He was sent home to have it dressed and cleaned up.

Three days later I was called in to see him.

His foot was much swollen, and a single large bulla covered the whole of the dorsum with a typical rash, extending by a broad, sharply-defined, slightly-raised, and infiltrated margin. The part was markedly distended by serum, but without any special redness. The bulla was antiseptically opened and a concentrated magnesium sulphate dressing every four hours was ordered.

Only one 10 c.cm. ampoule of polyvalent serum was available, and this was given intravenously. As no more serum was available it was decided to try milk injections.

Altogether six injections of 10 c.cm. of milk were given every other day, intramuscularly, into the buttocks.

Internally, tincture of perchloride of iron in half drachm doses was given. As a dressing, only concentrated magnesium sulphate was used.

The results were gratifying and in ten days the patient was much improved, and in less than three weeks he was well on the road to a complete recovery.

A CASE OF CEREBRAL MALARIA

By D. B. BHATE, L.M.P. (C. P.)

Shree Nath Surgico-Medical Hall, Chhindwara

In the month of June last I was called one evening to a female patient aged about 8 years. She was reported to have been unconscious for about twelve hours.

On examination, I found that the patient had a temperature of 103°F ., pulse 130 per minute, regular, respirations 30 per minute. The patient was unconscious with jaw tightly closed. It could not be opened even with physical manipulation. The lungs were clear and so was the heart. On palpating the abdomen the spleen was found to be enlarged to two finger-breadths below the costal margin; the liver was not enlarged. The bowels were constipated.

I gave one intramuscular injection of quinine gr. x in 2 c.cm. in the gluteal region.

Early in the morning, I went to see the patient and found her quite conscious talking as usual and feeling great relief. The relatives told me that the patient regained consciousness about six hours after the injection.

A CASE OF BANDICOOT-BITE FEVER

By M. D. PILLAI, L.C.P. & S.

Medical Officer, G. S. M. Co., Ltd., Kammatharuvu Mines, Bellary District

N. M., a Mohammedan, aged 40, a mine cooly, came to the dispensary on the 9th June for treatment.

History of the case.—He was bitten by a bandicoot on the left hand one night while he was sleeping, about 20 days ago. The following morning he applied some country medicine to the wound (cocoanut rind burnt and mixed with oil). As it was not giving much pain he went to work as usual. After a few days he began to get pain which steadily got worse on the spot where the bandicoot had bitten, so he presented himself for treatment. He had throbbing pain, fever, headache, coated tongue, constipation and pain all over the body. The site of the bite and its surroundings were swollen, very tender and painful. The axillary glands of the same side were enlarged and painful. His temperature was 102.4°F ., with pulse 110 per minute.

Diagnosis.—On the above symptoms the case was diagnosed to be one of bandicoot-bite fever.

Treatment.—He was given plasmoquine compound one tablet and five grains of quinine thrice daily. Hydrarg. subchloridum, five grains at bedtime, was given, and this was followed by one and a half ounces of magnesium sulphate mixture next morning. Locally, liniment of iodine was applied and hot boric fomentations were ordered.

The next day his fever continued, there was intense pain, increased swelling, and he was restless. He was given an intramuscular injection of sulfarsenol, 18 centigrammes, and hot antiphlogistine was applied locally. His temperature in the evening came down to 101.2°F . with pulse 100 per minute.

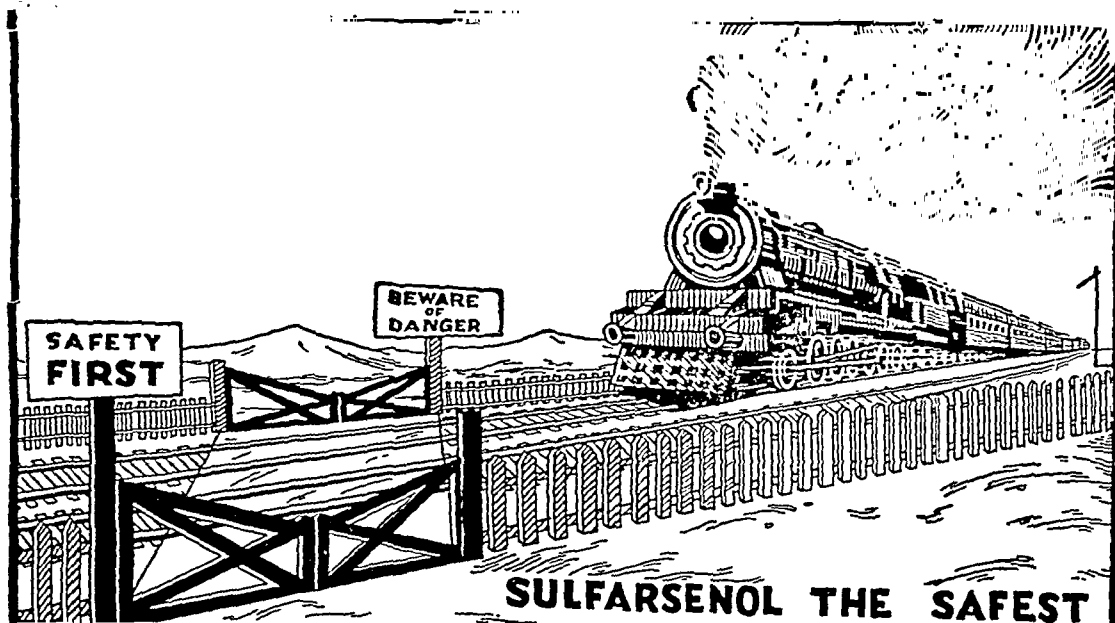
On the following morning his temperature was normal and general condition had improved. Plasmoquine compound and quinine were repeated and antiphlogistine continued. The improvement continued and on the fifth day after admission treatment was discontinued.

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Indian Medical Gazette

NOVEMBER

RONALD ROSS

THE British race can claim with every truth that it has conferred many benefits upon this country; had it conferred no other than the gift of western medicine, the people of the sub-continent might still rise up and call it blessed. Of all the blessings which western medicine has been able to confer, none are surpassed by those which originate from the work of Sir Ronald Ross, K.C.B., K.C.M.G., F.R.S., N.L.M.D., D.Sc., LL.D., F.R.C.S., F.S.A., D.P.H., whose death on September 17th, at the age of 75, it is our sad duty to chronicle.



Until comparatively recently, western medicine, to India, meant almost entirely the Indian Medical Service, and in a long series of names notable not only in the annals of that service, but in the annals of the profession of medicine itself, none is more illustrious than that of Ronald Ross. Our service readers must be proud this day to be able to say, 'I too am a member of the Indian Medical Service'.

Ross was a Bart's man, but in his *Memoirs* he admits to having at that time little interest in medicine. He passed his examination for membership of the Royal College of Surgeons five years after entering the hospital, but, having done only one day's reading for this examination, failed for the L.S.A., which, being the easiest examination, was all he tried for. Thereupon he went to sea as a surgeon in the

Anchor Line—a single qualification being all that in those days was necessary—to continue his reading. Actually, he did not take his L.S.A. until seven years after entering hospital, immediately thereafter passing seventeenth into the Indian Medical Service, his commission being dated April 2nd, 1881. During his subsequent four months' course at Netley, he complains that he was taught nothing of bacteriology (by then an established science on the Continent), nor did he hear anything of the already three-year-old discovery of the parasite of malaria (quartan) by Laveran.

The next fourteen years of his life were spent in not very eventful military service in Madras, Burma and the Andamans. He saw active service in the Chin-Lushai Expedition of 1889 to 1890, but generally his energies seem to have been devoted to poetry, music, and an unsuspected mathematical talent which first showed itself on his arrival in Madras. However, the fires that were in him were beginning to burn clear. On his first leave (1888) he took the newly established diploma of public health, and also, with two months' study leave, studied bacteriology under Klein. It was at this time that he learned his microscopical technique. But it was not until his second leave, 1894-95, that he really entered upon his life's work. He was then a surgeon-major, and thirty-eight years of age. During the previous four years of duty he had naturally seen much malaria, and had tried to study it, with such poor success that he even came to throw doubt (in various scientific contributions, including one in this journal) on Laveran's discovery. It was not until he reached England that the great Vandvke Carter, a brother officer, showed him the genuine parasite in the blood. Enquiries there led him to Sir Patrick Manson, and the great intellectual partnership, that was to terminate in 'the saving of one-third of the world', was begun.

There is no need here, even were space available, to recapitulate the story of the next four years. Oft re-told in brief, to be appreciated it must be read in the 110 original letters, partly reproduced in his *Memoirs*, that passed between him and the 'founder of tropical medicine'. Starting work at Secunderabad on his return in the hot weather of 1895, he saw there his first oöcyst, in what he afterwards believed to be *Anopheles stephensi*, on August 25th, 1897. His final proofs, of the transmission of bird malaria, including the transmission of the sporozoites *via* the salivary glands, were made in Calcutta, presumably with *Culex fatigans*, in July 1898. In this connection one should read, *pari passu* with his *Memoirs*, the report of Daniels, sent to check his findings, to the Royal Society's Malaria Committee, which gives many illuminating side-lights on his technique.

Many of our readers will remember that afternoon in January 1927 when some of us

assembled, headed by Lord Lytton, then Governor of Bengal, in a shamiana in front of the Victoria Memorial to pay homage to him at the unveiling of the memorial gate in the wall of the Presidency General Hospital grounds, near the laboratory where his final proofs were obtained. In spite of the years then upon him his mental and physical strength appeared but little impaired. Despite all the world-recognition and adulation he had by then received, he made a simple, unassuming and humorous speech, referring to the mosquito nuisance all too patent in the shamiana, as an instance that in mosquito matters Calcutta stood here it did when he was last there 27 years ago! Before the ceremony we wondered whether His Excellency was about to rectify an obvious oversight and to confer on Sir Ronald, some specifically Indian decoration, but no pronouncement was made—nor was it made subsequently—and he has died, with the honours of his King, of foreign governments, and of learned societies throughout the world, thick upon him, but without one single mark of recognition—as far as the outside world can judge—from the government of the country where he was born, where his work was done, and where his great discovery was made.

We are too near him yet to appreciate him in all his greatness. The dust of unfortunate scientific and official conflicts has yet to pass entirely away. Pass it will, only to be remembered amongst curiosities of medical history. The work he did, the man he was, will remain, an outstanding figure in the history of our profession, a star of equal magnitude in that constellation whose other brightest suns are Jenner, Simpson, Lister, Pasteur and Koch.

Olim meminisse juvabit.

PLASMODIUM OVALE STEPHENS, 1922

A RECENT paper by James, Nicol and Shute (1932) raises once again the question of the validity of this new species of malaria parasite, and it may be of interest to summarise briefly the evidence to date with regard to it.

Plasmodium ovale was first described by Stephens (1922) in blood films from a British soldier invalided from East Africa during the war in January 1918. On admission to the Liverpool School of Tropical Medicine from 8th April, 1918, to 27th July, 1918, blood films from this patient showed what was diagnosed as a pure infection with *Plasmodium vivax*. For the next four days the films were negative. On the 28th July, 1918, parasites were again present and the diagnosis was ? simple tertian. On the 29th July, 1918, the diagnosis was ? simple tertian, ? quartan.

Owing to the peculiar character of the forms seen blood films were taken four hourly during the day time from 30th July, 1918, to 3rd August, 1918, and stained for one hour with Leishman's stain. The temperature chart during this period showed a tertian periodicity, with which the parasite phases seen in the blood films appeared to correspond. Before and after this period, however, the temperature chart was irregular. On examination of these films Professor Stephens concluded that he was dealing with a new species to which he gave the name *Plasmodium ovale* to emphasise the fact that the infected red corpuscles were frequently oval in shape, and often with fimbriated or crenated edges.

(It would appear that this conclusion was reached on a re-examination in 1922 of the original films taken in 1918).

The appearances seen are illustrated in a very clear colour plate. The ring forms are round or oval and non-amœboid. The infected red corpuscles are not uncommonly oval—sometimes oval with a drawn-out pointed tail—and with irregular margins. The growing trophozoite forms are very characteristic. They rather closely resemble those of *Plasmodium malariae* and present the solidity or compactness of that species. The amount of chromatin and the distribution of the pigment in a lateral band also recalled the appearances seen in *Plasmodium malariae*, but equatorial and band-like trophozoites were not seen. 'The characteristics of this parasite so far as concerns the medium forms are a non-amœboid, pigmented, round or oval parasite, resembling quartan, in a red cell showing Schüffner's dots, which is either normal in size or only slightly enlarged. The pigment, so far as can be judged in stained specimens, appears to be brownish black, and granular rather than spicular'. (It may be remarked that the stippling of the erythrocytes shown in the plate is rather coarser than are Schüffner's dots, and perhaps scantier in the number of dots). The maximum number of merozoites seen in mature schizonts was 12. Mature schizonts occupy red cells which are either normal in size or slightly enlarged. A slight margin showing Schüffner's dots is often seen, and the cell is clearly decolorised. No gametocytes were seen.

The next contribution to the subject is the paper by Stephens and Owen (1927). The patient here concerned came from Nigeria. The first diagnosis made was *Plasmodium malariae*, but further examination showed that forms corresponding to *Plasmodium ovale* were present. A series of slides, thirty-six in all, was taken from 17th February, 1925, to 2nd March, 1925, and carefully studied. The parasite forms encountered are stated to have conformed in all respects with *Plasmodium ovale*, and a very interesting set of photomicrographs accompanies the paper. The oval shape of the infected red corpuscles was a conspicuous feature throughout the films, both in thin and thick parts. There is often distinct decolorisation of the red cells. The dots are distinct and numerous, but the stippling more faintly stained than are Schüffner's dots. The trophozoites are round or oval and non-amœboid. Pigment is coarse, dark and abundant, resembling that of *Plasmodium malariae*. The largest number of merozoites in the mature schizont was fourteen, whilst daisy-like forms with eight to ten merozoites arranged around a central mass of pigment were seen. Equatorial and band forms also occurred, whilst the gametocytes were indistinguishable from those of *Plasmodium malariae* except for the stippled decolorised margin of the red cell. The periodicity could not be determined from examination of the slides.

The third paper is by Warrington Yorke and Owen (1930). This patient also came from Nigeria. Examination of blood films showed parasites identical with *Plasmodium ovale*. The strain was passed by direct blood inoculation through a series of five general paralytics or tabetics, and throughout maintained its characteristic morphology. As the temperature charts in the paper very clearly show, the fever shows a very definite tertian periodicity in all six cases. 'The parasite itself appears to be indistinguishable morphologically from *Plasmodium malariae*', write the authors. 'It differs, however, in that its cycle of schizogony is completed in forty-eight hours, and temperature charts of infected cases are of the tertian type..... The characteristic appearance of the infected red cells, to which Stephens' attention was originally drawn, was clearly seen in the naturally infected case and in all five subinoculated cases. The infected red cells are moderately enlarged—occasionally enormously so; they are pale, fragile, frequently oval, usually with irregular ragged outline, and heavily stippled'.

Finally comes the important paper by James, Nicol and Shute (1932). The strain of *Plasmodium ovale*

with which these workers carried out their experiments was obtained in citrated blood from a patient in the Belgian Congo. It was first inoculated intramuscularly into a general paralytic, and he developed malaria six days later. By direct blood inoculation the strain was sub-passaged into fourteen other patients with general paralysis, and in all of them the course of the fever and the morphological characters of the asexual forms of the parasite were the same. The infections were mild and tended to clear up spontaneously without treatment, with only a scanty production of gametocytes. Instead of increasing gametocyte production, a single dose of quinine cured the infection. Finally, however, a patient was available who showed 12 male and 72 female gametocytes per c.mm. of blood. A batch of 40 *Anopheles maculipennis* was now fed on this patient and kept at 25°C. Later, a second patient with a fair production of gametocytes became available for mosquito feeds; a batch of 100 *Anopheles maculipennis* was fed on this patient during five days, and kept at 25°C. The donor's temperature chart showed typical tertian periodicity.

Of 37 mosquitoes fed and subsequently dissected, 20 (or 54 per cent.) were found infected, but the infections were always slight. Sporozoites were found in the salivary glands from the sixteenth day onwards.

Infected mosquitoes were now fed on four further patients, all of whom developed malaria. The incubation periods were 14 to 15 days, and the fever which developed showed typical tertian periodicity. Examination of blood films showed that the parasites conformed in all respects to the previously described morphology of *Plasmodium ovale*, and that the schizogony cycle took 48 hours. Further, 'the arrangement of the pigment in the stage of young oöcysts is so different from that of any of the species hitherto known as to enable the parasite to be identified without difficulty at this stage of its life cycle'.

At this point, the authors most unfortunately come to a stop. 'We shall take an early opportunity of describing and illustrating these and later stages of the mosquito cycle, as well as the sexual stages of the parasite in the human host which were not studied by previous observers. In the meantime we can say definitely that there remains no doubt that *Plasmodium ovale* is a separate species, and that its morphological characters in the human and insect hosts are characteristic and constant'.

Whilst we must admit that the evidence analysed above is strongly in favour of the validity of the new species, yet we think that malariologists and laboratory workers in general throughout the tropics will not rest content with the *ex-cathedra* pronouncement with which Colonel James and his colleagues conclude their paper. It is precisely that full, detailed and illustrated account of the morphology and life cycles of *Plasmodium ovale* that has been promised that they will look forward to for final proof.

It will be noted that, so far, *Plasmodium ovale* has been reported only from Africa. Yet there is now sufficient evidence to enable laboratory workers to diagnose the new species, should they come across it.

Plasmodium ovale infection can presumably be diagnosed by the following observations:—

(1) The temperature chart shows very regular tertian periodicity.

(2) The infection is as a rule a light one, with a low degree of infection and only scanty production of gametocytes.

(3) It is extremely amenable to quinine treatment.

(4) The general morphology of the parasite, on the other hand, conforms very closely to that of *Plasmodium malariae*, the parasite of quartan malaria.

(5) The infected red corpuscles are of normal size, or only slightly enlarged. They are often paler than normal. It is very characteristic of the infection that the infected erythrocytes are distorted into an oval shape, whence the name of the species. They

(Continued at foot of next column)

Special Articles

IMPLANTATION OF THE URETERS FOR INOPERABLE VESICO-VAGINAL FISTULA AND ECTOPIA VESICÆ: A NEW TECHNIQUE*

By V. B. GREEN-ARMYTAGE, M.D.
F.R.C.P. (Lond.), F.C.O.G.

LIEUTENANT-COLONEL, I.M.S.

Professor of Midwifery and Gynaecology, Calcutta Medical College

THE problem of devising a simple one-stage operation of implanting the ureters into the bowel has long been occupying my mind, for if the blood-urea estimation and general condition of the patient are fair, there would seem no adequate reason for failure, provided the technique is simple and within the means of the general surgeon or pure gynaecologist.

It is of course admitted that the results of a two-stage operation are excellent. The statistics of Fraser, the pioneer of this operation, of Gow and myself in India, and those of Coffey, Grey Turner, Jocelyn Swan, Nitch, and others in the West, all amply demonstrate that fact; but it seemed to me that one should be able to

* Being a paper read at the All-India Science Congress, January 1932, and reprinted by kind permission of the Editor from the *British Journal of Surgery*, Vol. XX, No. 77, 1932, p. 130.

(Continued from previous column)

frequently show fimbriated or crenated margins. They show a very well-marked stippling, recalling in general Schüffner's dots, but which is perhaps rather coarser and more scanty in distribution.

These points may perhaps enable the laboratory worker in India to identify *Plasmodium ovale*, if he should encounter this new and interesting species of malaria parasite.

R. K.

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CORRIGENDUM

(Primary Bronchogenic Carcinoma. I. M. G., October 1932)

We regret that owing to a misunderstanding only half the illustration of the skiagram of the lungs was reproduced. The mistake was not noticed until it was too late to rectify it. The original skiagram showed that the left side of the chest was completely opaque. We tender our apologies to Dr. Seal.

obtain Coffey's results, in the one-stage operation, if a simpler and more rapid technique could be discovered; for such an operation in the hands of a quick surgeon is called for in cases of ectopia vesicæ, inoperable and inaccessible vesico-vaginal fistulæ, carcinoma of the bladder, and certain gunshot injuries of the pelvis, and occasionally in post-radium bladder fistulæ.

Historical

Between the years 1899 and 1903, Peters in Canada and Lendon in Australia were the first to publish successful cases of transplantation of the ureters. Since then, surgeons all over the world have endeavoured to improve the technique. In the early days of the operation, surgeons transplanted the ureter-bearing area of the bladder, with its valve mechanism, into the bowel, but their results were only successful in 50 per cent. of the cases, owing to the fact that the physics of the living was not appreciated—that is, they failed to differentiate and separate the function of a sphincter from that of a valve, and failed to recognize that urine is delivered, after operation, from the duct of an organ which works under low pressure into a receptacle where the pressure is higher.

It is to Robert Coffey that surgeons owe the elucidation of previous failures, for he followed out Harvey's injunction 'study and seek out the secrets of Nature by way of experiment'. In 1908, when working with the Mayo brothers, investigating pancreatic surgery, he demonstrated that when the common bile-duct was transplanted by the direct method, it had become enormously dilated when observed a few weeks later. This accidental discovery led him to the solution of the mechanism used by Nature when secreting fluid at low pressure into a cavity of higher pressure. Carrying his investigations further, he discovered the secret, so far hidden from surgeons and anatomists alike—namely, that in the case of such a tube as the ureter the duct first penetrates the muscle, then runs immediately beneath the loose mucous membrane for a distance before it emerges into the lumen of the bowel. This being so, in order to achieve success in such a case as implantation of the ureters, it was essential to devise an operation which copied the valve mechanism found in Nature. Experimenting on dogs, Coffey's logical deductions were completely justified, and within the next few years Dr. Mayo, giving all credit to the brilliant conception of Coffey, operated with success on a number of cases of ectopia vesicæ, dealing with one ureter at a time.

In 1925 Coffey, having done many of the two-stage operations of transplantation of the ureters which he had originally planned, became dissatisfied with the misery and delay entailed, and therefore commenced a series of experiments, using ureteric catheters as a means of

conveying urine from the kidneys in order to obviate the risk that he had observed of an inflammatory exudate in the gut wall compressing the ureter and so predisposing to uræmia. After many trials and ups and downs of technique he evolved the admirable operation which was published in the *Annals of Surgery*, in June 1927, for bilateral transplantation of the ureters, and in November 1929 he published an inspiring report of 20 cases operated upon by this method with only 1 immediate surgical death.

While all honour must be rendered unto Coffey for the original research work, it must not be forgotten that Sir Harold Stiles in Edinburgh, and later Grey Turner in Newcastle, from 1911 onwards, were performing a two-stage operation of implantation of the ureters, using a technique much after the fashion of Witzel's gastrostomy; Grey Turner recorded 17 cases with 4 deaths.

The first implantation operation in the Eden Hospital, Calcutta, was performed in 1912 on a girl of 14 suffering from extrophy of the bladder. Briefly stated, Peters' technique was followed. After a stormy convalescence complete cure resulted. The patient was seen from time to time, and in 1926, when she was 28 years of age, she came to hospital nine months pregnant. Cæsarean section was performed with complete success (Green-Armytage, 1926).

The admirable results reported by Fraser, in Madras, of cases of the two-stage operation for inoperable vesico-vaginal fistulæ inspired Gow and the writer to follow his technique, and our results of this two-stage operation are commendable. But for a long time it has seemed to me necessary to devise a simple operation with all the advantages of Coffey's method without its complicated technique—a method which would eliminate the dangers and disappointment of two anæsthetics on cachectic young or old patients.

The accompanying series of diagrams will not only explain the technique used in my first series of operations for bilateral ureteric implantation, but will make clear the two-stage operation to those surgeons who have as yet not attempted it, or have no desire to run the risk of transplanting more than one ureter at a time.

CASE REPORTS (Group I)

Case 1.—S., age 20, admitted for dribbling of the urine, subsequent to difficult childbirth one year ago. There is atresia of the vagina, which feels like a cartilaginous canal. The fistula is on the anterior wall, the size of one rupee. There is a history of one month's amenorrhœa. Blood-urea 0.015 per cent. General condition fair.

Both ureters were transplanted at one sitting, and except for twelve days' post-operative fever, recovery was uneventful.

At the time of operation she was seen to be pregnant. On April 3, 1931, she was re-admitted in labour and was delivered by Cæsarean section of a healthy child, leaving hospital fifteen days later.

Case 2.—H., age 18, history of still-birth and difficult labour eight months previously. The vagina admits one

finger only, and in the vault of the vagina there is a fistula with a sharp fibrous margin through which the upper surface of the bladder projects. The pelvis is rachitic. General condition fair.

Both ureters were implanted on Sept. 1, 1930. The following day the general condition was good; temperature 100.5°; 23 oz. of urine had been collected from the rectum. The next day she passed 34 oz., on the third day 16 oz., and on the fourth day only a few ounces were passed. She rapidly sank into coma and died of uræmia that night. Post-mortem was refused, but there was no distension or peritonitis.

I am convinced that the ureters in this case were compressed by an inflammatory exudate which dammed back the flow of urine, precipitating uræmia. For this reason I did not feel justified in further attempts to implant both ureters at one sitting until I could devise some method of getting over this difficulty of an inflammatory exudate compressing the soft ureter. During the interim therefore I went back to the two-stage operation and implanted many single ureters at a time without a death. But I was not satisfied, and determined to try again, using a means readily accessible to any surgeon—namely, the straight portion of a metal prostatic catheter, the curved part of which was cut off and a straight conical screw bulb substituted (figure 11). When all is ready the metal tube is passed through the stab incision down to the anus, and its canal is used as a tunnel to transmit the ureteric catheter to the rectum and anus without bother or kinking. (The figures will, I trust, make the following account intelligible.) But before proceeding I will describe the technique first used for one or both ureteric implantation operations.

Technique

For nine days before operation the rectum is washed out daily with saline or weak permanganate solution. For the first three days the patient is given the following prescription four-hourly:—

℞ Potassii citratis.		
Magnesi carbonatis pond.	..	āā gr. xxx.
Glucose	..	ʒiij.
Aque	..	ʒi.

The second three days 1 drachm of acid sodii phosph. in water is given first thing in the morning, followed by 10 grains of urotropine three times a day; the third three days the former alkaline mixture is taken.

Directly the patient is under the anæsthetic, an assistant very slowly perfuses 300 c.cm. of a 20 per cent. solution of glucose into the vein.

After opening the abdomen with the patient in the Trendelenburg position and buttocks raised upon a stout sandbag, the intestines are walled off in the usual way; the right ureter is quickly dissected out down to the bladder, leaving as much of its peritubular fascia around it as possible, and a piece of linen tape or a small blunt hook is passed under it. The ureter is not cut and made ready for implantation until the next stage of the operation is complete.

The sigmoid is held up by two silk threads which are inserted about 3 inches apart. A gutter

is now made in the bowel wall $1\frac{1}{2}$ inches long between the two silk threads, which are held taut. The handle of one's knife makes an excellent reflector of muscle and peritoneum. This stage of the operation takes only a few minutes.

The ureter is now caught up by a rubber-covered Kocher forceps, tied, and cut near the bladder, the distal end being touched with carbolic. The proximal end is brought up to the surface, and the pen-cut proximal lumen of the ureter is traversed with catgut, threaded with a needle at both ends, and a no. 12 flute-ended opaque catheter is passed for 5 or 6 inches up the ureter. The ureter is bound to the catheter by a single loop of 000 catgut.

A stab incision is made at the lower end of the gutter into the colon, and a straight short metal tube with a screw top is passed through it down to the anus. An assistant grasps it, unscrews the cap, and then the proximal end of the catheter is passed down the tube until the lie and line of the ureter are in the gutter previously made. *The metal tube is then pulled down and out of the rectum and reboiled ready for the other ureter procedure.*

In some of the early cases I had considerable difficulty in coaxing the metal tube down to the anus sufficiently far for my assistant to reach it with his fingers. I have now countered that trouble and source of delay by the simple procedure of passing into the rectum before the operation a medium-sized Kelly's cystoscope loaded with its blunt-nosed plunger, just as one would pass a proctoscope. When the stab incision referred to above is made in the bowel wall, my assistant directs the cystoscope towards the incision, the plunger is then removed and the metal tube containing the catheter is passed directly into the lumen of the cystoscope, and pushed through from above out of the proximal handled end of the cystoscope. This manœuvre is simple and quick and has given great joy since its discovery.

The double threaded catgut needles are then passed through the stab incision to emerge $\frac{3}{4}$ inch below the gutter and about $\frac{1}{4}$ inch apart. They are drawn upon, thus bringing the ureter down through the stab wound into the bowel; the catgut threads are then tied, thus loosely anchoring the ureter to a point at least 1 inch below the stab incision. Three or four interrupted fine catgut sutures are then passed from one edge to another, picking up the peritoneum, muscle, and ureter in order to close the incision and secure the position of the ureter. The edges of the stab incision are brought in close contact by fine catgut which traverses the wall of the ureter, thereby further anchoring the ureter and preventing back leakage from the rectum. The remaining portion of the catheter-containing ureter in the gutter is then covered by a continuous Lambert suture up to the site where the ureter emerges from its bed under the initial incision in the peritoneum as in Coffey's illustrated article.

Exactly the same technique is adopted on the left side with the left ureter except that the incision in the bowel wall is on the left of the longitudinal band, and about 1 inch below the level of the right gutter.

The two subperitoneal tunnels from which the ureters were brought up are now closed with catgut, and after a look round to see there is no oozing or any retroperitoneal hæmatoma forming—all towels are removed—the omentum is brought down and the abdominal wall is sutured in the usual way. No drainage is used. In all eight cases now to be recorded the urine began to flow at once from each catheter. In order to prevent kinking or pressure on the catheters they are threaded through a short flatus tube which is passed through the anus. The ends of the catheters are inserted into a measured quantity of carbolic solution.

CASE REPORTS (Group II)

Case 3.—I., age 22, history of one difficult labour. Now almost complete atresia of the vagina, the fistula being visible at the top of the canal, which admitted the little finger only. There was in addition a stone in the bladder the size of a hen's egg and a recto-vaginal fistula high up. Blood-urea 0.022 per cent., Hb. 55 per cent., R.B.C. $2\frac{1}{2}$ million. On Aug. 26, 1931, the stone was removed after incising the vagina.

A fortnight later, under pernocton and ether anaesthesia, both ureters were transplanted into the rectum by the method described. The patient ran a temperature for twenty days but made an uninterrupted recovery, the recto-vaginal fistula being successfully operated upon on Nov. 13, 1931.

Case 4.—B., age 20, admitted on Sept. 4, 1931. History of one difficult labour. The whole of the base of the bladder and urethra have sloughed away, leaving a large gap surrounded by dense fibrous tissue. The patient was pregnant two months. Blood-urea 0.02 per cent., Hb. 50 per cent., R.B.C. 3 million.

Transplantation of both ureters, as above, was performed on Sept. 14. Except for slight fever for the first ten days and the fact that the patient normally aborted on the eighth day after operation, recovery was uninterrupted. She left hospital cured on Oct. 15.

Case 5.—B., age 40, admitted on Oct. 7, 1931. History of three difficult labours—the last resulting in the formation of a fistula, the size of a rupee, at the junction of the cervix and bladder, surrounded by dense scar tissue. Blood-urea 0.04 per cent., Hb. 70 per cent.

On opening the abdomen there was a large right tubo-ovarian hydrops. This was first resected. Both ureters were then transplanted as above. The patient was in excellent condition, passing urine plentifully for the first three days, but on the fourth day she suddenly became cyanosed, coughed up blood, and died of pulmonary embolism.

Case 6.—R., age 18, admitted on Oct. 8, 1931, with a large fistula involving the urethra and bladder, the result of difficult labour with dead child eight months previously. Blood-urea 0.036 per cent., Hb. 70 per cent.

Careful vaginal dissection failed to approximate the edges. Laparotomy was done on Dec. 7. Both ureters were implanted, using opaque catheters. An interesting feature of this case was the presence of two ureters on the left side lying collaterally. The upper ureter, being twice the calibre of the lower one, was the one implanted. This condition of double ureters is recorded by both Grey Turner and Thomson-Walker. Recovery after ten days' slight pyrexia was uneventful, both implanted ureters draining perfectly. There was just the scantiest wetting of the bedding from the vagina, owing to the lower ureter slightly functioning. It is probable that this extra ureter will cease to

function; if not, it will be implanted separately later. The patient is walking about and quite happy on the fifteenth day after operation. On Feb. 17, 1932, the extra ureter was dealt with. She left hospital cured on March 1.

Case 7.—F., age 18, admitted on Jan. 11, 1932, with an enormous rigid hole at the base of the bladder due to difficult labour one year ago; the baby was born dead. Hb. 45 per cent., blood-urea 0.025 per cent. Transplantation of ureters on Jan. 25. Urine drained well from the start. Had double rise type of fever for three weeks which reacted to urea-stibamine and was shown to be due to kala-azar. She left hospital happy on March 5.

Case 8.—A., age 19, admitted on Feb. 2, 1932, with an atresic vagina and unapproachable fistula due to labour eight months previously. Hb. 50 per cent., blood-urea 0.63 per cent., R.B.C. $2\frac{1}{2}$ million. Under pernocton and ether both ureters were transplanted on Feb. 15. Recovery uneventful. Discharged cured on March 11.

Case 9.—S., age 30, admitted on Feb. 19, 1932. Her condition was the same as the previous case, and had existed since her last child was born dead twelve years ago. Hb. 46 per cent., blood-urea 0.03 per cent. Operation as before, but on the third day the temperature went up to 105° and remained high despite all treatment. She died of uræmia on March 19. Post-mortem refused.

Case 10.—A., age 28, admitted on March 12, 1932, for a fistula admitting two fingers at the top of a lacerated vagina. She had had twelve labours, all at full term, and all the babies had been born dead. The fistula had only occurred after the last childbirth. Both ureters were implanted on March 21. For the first eight days all went well, but the patient then grew very boisterous. The temperature became subnormal. She passed only 12 oz. of urine for the next two days, and then sank into coma, dying on March 31. At autopsy, both kidneys were large, sacculated, and full of pus, from which *B. coli* and staphylococci were cultured.

Operation comments

Some surgeons insert a suprapubic drain for twenty-four hours. The experience gained from a large number of both classes of operations convinces me that this is not necessary, all the cases having healed by first intention. Grey Turner (1929) implants both ureters on the right of the colon and into the longitudinal muscular band, one 2 inches above the other, the left ureter being passed under the colon. I think this must be a more difficult procedure and conducive to oozing.

In some cases the ureter is greatly dilated owing to obstruction by old inflammatory tissue in the parametrium. When inserting the catheter in these cases it is wise to run a purse string round the end of the ureter so as to grasp the catheter lightly. In order to secure good vision in the field of operation a large Doyen retractor is better than anything else. Before closing the abdomen the uterus should be ventro-suspended to prevent adhesion of its posterior surface to the bowel and subsequent pelvic disorders. All patients should be warned in the event of pregnancy to attend an antenatal clinic and come to hospital in their eighth month for Cæsarean section at term (see Case 1).

All patients, whether the technique be that of a one- or two-stage operation, run a temperature for ten or twelve days afterwards, presumably owing to mild pyelitis. The first.

IMPLANTATION OF THE URETERS

Figs. 1-6 illustrate method of implantation used *without* ureteric catheters.
Figs. 7-11 illustrate same operation *employing* ureteric catheters and straight metal tube with removable bulb-end.

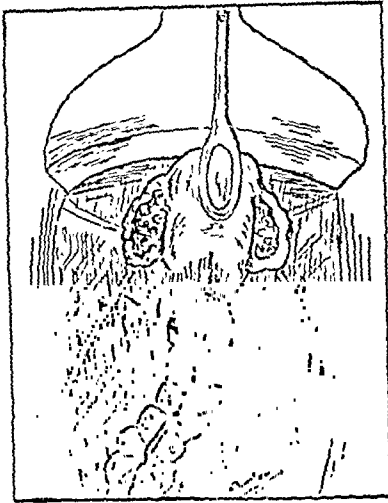


Fig. 1.—Looking down into the pelvis with Doyen's retractor at lower end of incision. Uterus drawn forward and intestines packed back out of view. Pelvic colon shown with faint line of uterus under pelvic peritoneum.

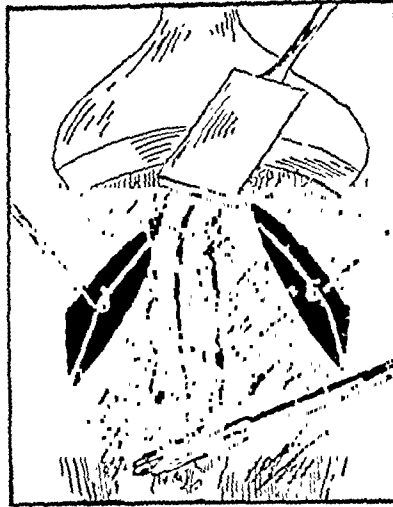


Fig. 2.—Shows both ureters dissected out with small blunt hooks under each. The pelvic colon has an intestinal clamp upon it at the level of the sacral promontory.

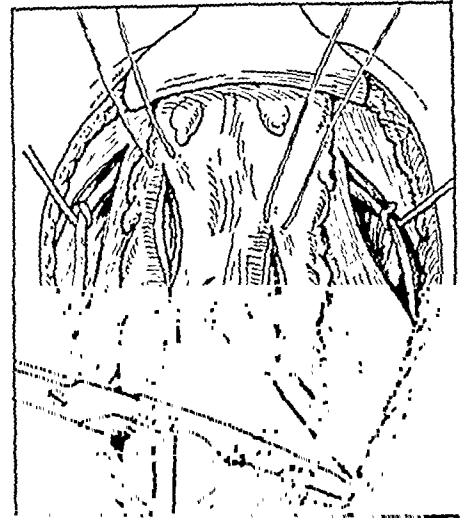


Fig. 3.—Before making the two gutters shown here on each side of the longitudinal band, the left gutter being at least 1 inch below the level of the right, long silk threads have been passed through the bowel muscle above and below the estimated incisions. Traction on these threads shown above permits the bowel wall to be held taut while the incision down to the mucous membrane through the muscle is made.

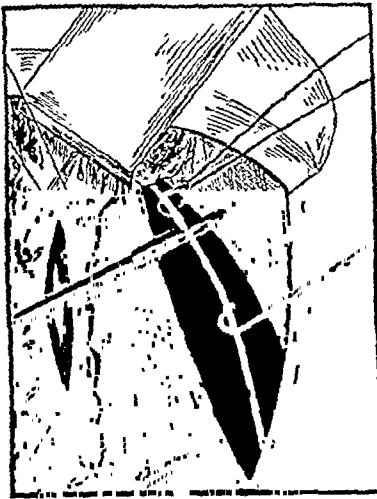


Fig. 4.—The isolated right ureter is clamped and tied close to the bladder. It is then cut obliquely. The clamp is a Kocher's forceps with the blades covered with rubber tubing, to prevent injury or undue pressure on the ureter.

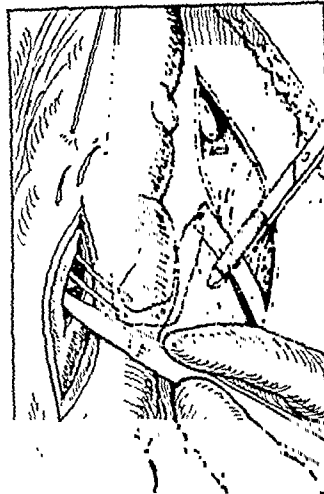


Fig. 5.—Catgut threaded at both ends with intestinal needles is passed through the lumen and wall of the ureter. The ureter is carefully laid in the gutter of the bowel and the two needles are passed through a stab wound made in the mucous membrane at the lowest portion of the gutter. The needles are made to emerge $\frac{3}{4}$ inch below the gutter and about $\frac{1}{4}$ inch apart. The two threads are then gently drawn upon until the cut end of the ureter is well through the stab incision. The catgut threads are then tied, so anchoring the ureter gently to the mucous membrane of the bowel.



Fig. 6.—The ureter in position, four ligatures of catgut are passed from one side to the other through the peritoneum, muscle, and wall of ureter to the opposite side and then tied. The stab wound in the mucous membrane is separately sutured with three catgut sutures which pass through the ureter and the mucous membrane on each side, so preventing any back leakage from the bowel through the stab incision.

IMPLANTATION OF THE URETERS

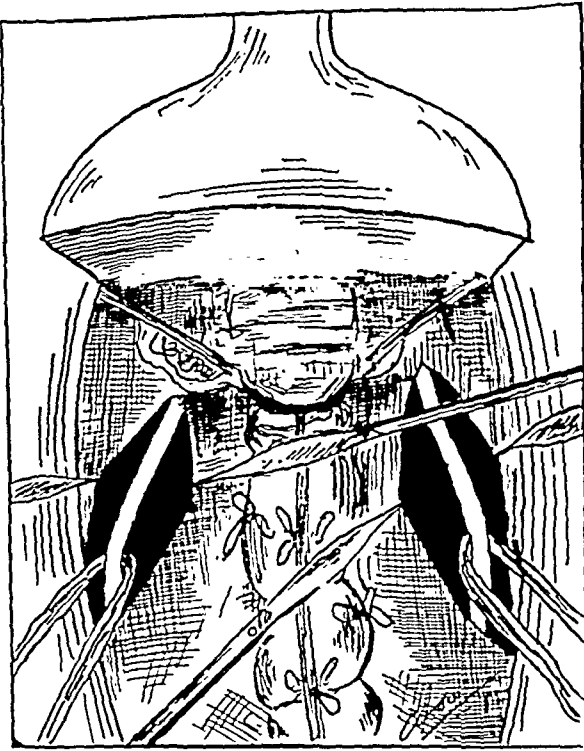


Fig. 7.—When using ureteric catheters. Both ureters have been exposed and dissected out. Two pieces of linen tape are shown passed under each ureter to act as retractors.



Fig. 8.—One ureter has been tied off close to the bladder and cut. As before, catgut threaded at both ends has been passed through the lumen and wall of the ureter. A ureteric catheter has been passed up the ureter for 5 or 6 inches. The proximal end of the catheter is then passed down a straight silver tube, the proximal end of which will be seen emerging from the stab incision.

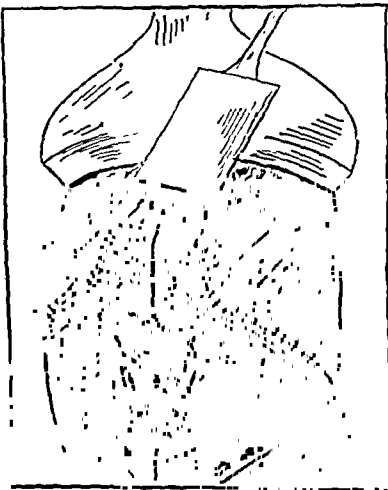


Fig. 9.—Shows the appearance when both ureters have been implanted and the initial incisions in the peritoneum to expose the ureters have been closed, with catgut.

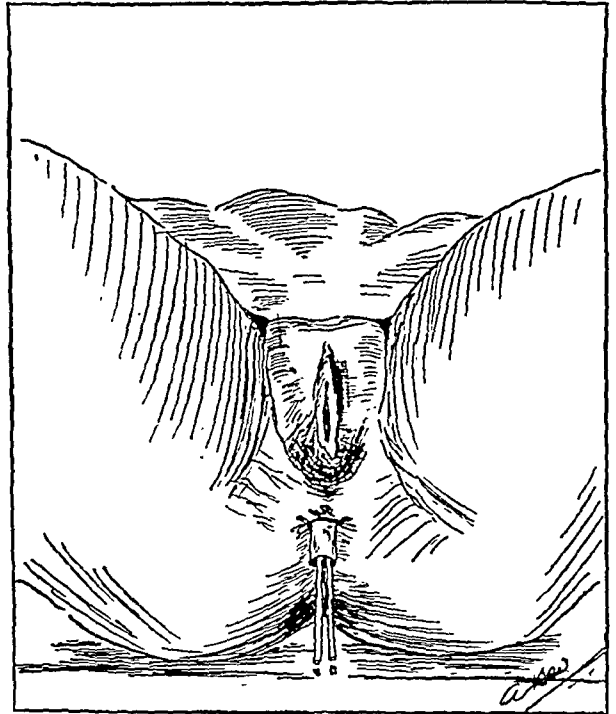


Fig. 10.—Shows both ureters dripping urine emerging from the anus. To protect them from sphincter action they have threaded through a short flatus tube.

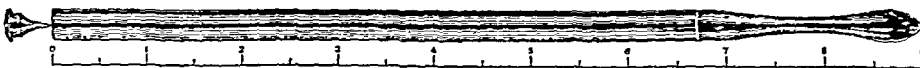


Fig. 11.—A full-size prostatic catheter from which the curved end has been removed and a screw bulb-end substituted. Total length 9 inches.

(2) The urine passes into a more-or-less definite receptacle.

(3) Absorption of water takes place during transit of urine along the whole length of the large bowel with consequent less desire to pass urine.

(4) There is no chance of solid contents interfering with the flow of urine from the kidney, as the contents in this area are fluid.

(5) The cæcum is easily fixed in a convenient position.

(6) The appendix stump orifice allows a convenient, easy and safe anastomosis by means of the inkwell method; and saves the employment (and cost) of a catheter.

(7) There appears to be no irritation when the urine passes into the cæcum as any acidity is quickly neutralised by the alkaline contents from the ileum.

Technique

The abdomen is opened by the usual paramedian incision with the patient in the Trendelenburg position. The intestines are dammed back and the peritoneum, over the right ureter, is snipped. Leaving as much perifascial and perivascular tissue as possible attached to the ureter, it is isolated down to the bladder, and a piece of tape placed under it. An incision is now made in the retro-cæcal peritoneum joining it to the initial incision over the ureter, i.e., just about the right brim of the true pelvis. The appendix is now isolated, a peritoneal cuff being turned down as usual, it is clamped and amputated in the ordinary way.

The ureter is now clamped near the bladder, ligated and cut, and brought up out of the pelvis and inserted through the orifice of the appendix stump for about two inches into the cæcum. The peritoneum of the cuff is invaginated all round the ureter and sutured with a few interrupted catgut stitches which catch up the peritoneum of the caput cæci and ureter with each suture. Another row of interrupted sutures picking up the ureter and cæcum is then inserted, and if need be even a third row is added so that the ureter is now inkwelled into the appendix stump without the least risk of leakage. The cæcum is then fixed to the incision made in the posterior parietal peritoneum by the ordinary cæcoplexy technique, and the peritoneum incision over the ureter is closed by a running catgut stitch.

The left ureter can now be implanted by the ordinary technique into the sigmoid, or this operation can be deferred for two weeks.

It might be thought that this operation would lead to a U-shaped kink in the right ureter, but when you come to do it and the cæcum is firmly fixed, as it should be, you will find that the line of the ureter from the kidney till its intromission into the appendix stump is perfectly straight.

Example

Miss X, aged 15, was admitted into the Eden Hospital in September 1932 for a congenital defect—the bladder

and vagina being one large receptacle due to absence of the posterior wall of the bladder and upper two-thirds of the posterior wall of the urethra. Matrimony, in this condition, was out of the question. On October 3 the right ureter was inkwelled into the cæcum, the operation taking three-quarters of an hour. There was none of the usual pyelitis fever and the patient was walking about on the 12th day. On October 17 the left ureter was implanted as usual into the sigmoid using a no. 12 ureteric catheter. Recovery uneventful.

I have added this postscript with the object of encouraging surgeons in India to tackle such cases as above, or those of inoperable vesicovaginal fistula, for my correspondence confirms me in thinking that such cases are seen in great numbers throughout India. It is my hope that, until such time as antenatal care comes into its own in India, the present pitiable cry of these patients 'let me be dry or die' will not be heard in vain by surgeons in the tropics.

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EPIDEMIC DROPSY GLAUCOMA

By E. W. O'G. KIRWAN, F.R.C.S.I.

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EPIDEMIC dropsy has again broken out in Bengal during this last monsoon and cases of glaucoma are now occurring very commonly as a result of this disease. The glaucoma is of a non-congestive variety and is accompanied by no signs of inflammation in the eyes. This complication of epidemic dropsy glaucoma usually occurs late in the disease, but during this epidemic cases are occurring with little or no signs of the general disease. Some of these cases which show no other signs of epidemic dropsy give a history of having had the disease during a former epidemic. Hindus and Mohammedans are affected, both males and females; the disease is uncommon amongst Europeans and Anglo-Indians. It occurs at all ages and small children are not exempt from this ocular complication. The symptoms with which the disease usually commences are rainbow haloes around lights and diminution of vision. These haloes are at first transient, but as the disease becomes more marked they become permanent. Patients complain also of difficulty in reading, as their sight is blurred. The disease is accompanied by no pain or redness of the eyes. The cornea may be normal in appearance, but on the other hand it may have a slightly steamy or ground-glass appearance, depending upon the amount of increased tension in the eyes. Even in the early cases where the tension is not much increased slit-lamp examination shows evidence of corneal oedema. The 'rainbow rings' which are due to oedema of the cornea are always a marked symptom of the disease, and they are important points in the diagnosis from ordinary primary non-congestive chronic glaucoma, as in this variety rainbow haloes are not often present. Turgescence of the anterior ciliary veins is usually very marked, but the conjunctiva and sclera are normal in appearance. The anterior chamber is never shallow, as in other varieties of glaucoma, it is always either normal or even deeper than normal. The pupil is normal in appearance and reacts well to accommodation and light. The ciliary body is not involved like the iris, except that weakness of accommodation due to oedema is nearly always present. The lens and media are not involved. The fundus cannot always be seen clearly owing to the corneal oedema, but in most cases

glaucomatous cupping is not present. There is usually marked hyperæmia of the optic disc. In cases of longer standing, such as of two to three months' duration, glaucomatous cupping is present, with evidence of atrophy of the disc. Retinal hæmorrhages are rarely found. The outstanding characteristic phenomenon of epidemic dropsy glaucoma is the very high tension of the eyes that one comes across. It is rarely below 50 mm. of mercury (Schiotz) and cases with 70 to 100 mm. of Hg. are quite common. I have come across some cases of over 100 mm. of Hg. tension. The tension normally remains constantly high but cases do occur which vary tremendously, even coming down to normal. Both eyes are always affected and the tension is usually about the same in both. With such high tensions one wonders why blindness from optic atrophy does not result much more quickly. The optic nerves seem to be able to resist these high tensions for some months, but the eyes invariably become blind, unless the tension is relieved. Cases are seen where the glaucoma has got well of its own accord when the epidemic dropsy has been cured, but invariably there remain much reduced visual fields due to optic atrophy from the increased tension.

The defects in the visual fields are the same as in chronic primary glaucoma. Enlargement of the blind spots with the formation of Scidel's sign, and contraction of the nasal fields are found in early cases. Ring scotomata with marked concentric contraction of the central vision are found in the later stages.

The causation of the rise of intra-ocular tension is an œdema of the ciliary body, produced by toxic amines formed in rice which has been badly stored. The toxins cause a dilatation of the capillaries and an increased transudation of plasma following damage to the endothelial cells. The normal channels for the outflow of aqueous humor are insufficient to carry away the increased amount of aqueous and so the intra-ocular tension goes up.

In the treatment of epidemic dropsy glaucoma, it is important not to delay. Medicinal treatment to lower the intra-ocular tension is most unsatisfactory. Pilocarpine and even eserine drops are practically useless. Purgatives, diuretics and diaphoretics are of very little use. Surgical treatment should be carried out as quickly as possible and the most successful operation is the Elliot sclero-corneal trephining. It is better to do one eye first and two days later to do the other eye. The results of trephining are most excellent and one has seldom to do a second trephine on the same eye. The operation of iridectomy for the relief of intra-ocular tension is unsatisfactory. The tension remains normal for a while but invariably goes up again, unless a filtering cicatrix results during the healing of the iridectomy wound.

The patient should of course be forbidden to eat rice of any kind and, as patients who have suffered from epidemic dropsy are very liable to get a relapse in a subsequent epidemic, he would be well advised to give up rice for ever and substitute for it bread or chappatti. I have constantly seen patients suffering from epidemic dropsy glaucoma who gave a history and showed signs of glaucoma contracted in a previous epidemic.

After operation, if possible, a change of climate to a place far removed from the endemic area is recommended.

THE DEFENCE MECHANISM OF THE HUMAN BODY*

By K. V. KRISHNAN, M.B., M.R.C.P.E.
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BEFORE I proceed to tell you something about the defence mechanism of the human body, I think it is

*Being a lecture delivered on the 27th August, 1932, at the Calcutta Academy of Arts and Sciences.

essential that I should explain to you the reasons that led to the choice of the subject. Some of you who were present on the inauguration day of this academy will remember what Sir C. V. Raman, the President, said to us while explaining the objects of the academy. He said that the primary object of the academy was to make every member tell the others about the problems he is most interested in. The subject of immunology being the one that is engaging my attention at present I could not think of a better theme for my lecture than the defence mechanism of the human body. The second reason for my choice of this subject is because I consider that for a mixed gathering of scientists such as the one before me, there is perhaps no other medical subject of greater interest than the one I have chosen. For, although originally the science of immunology was studied only by medical men for the purpose of solving urgent problems concerning diagnosis, prevention and cure of disease, it is now being increasingly recognised that immunology is but an important branch of general biology and that its problems are of interest not only to the medical man and the biologist but also to the chemist, the physicist, and the mathematician. Furthermore it is the one branch of science, more than any other, that has benefited most by the recent advances in the sister sciences and thereby shown that the line of demarcation between the sciences is very faint indeed. The third and last reason for my choice of the subject is because immunology is a young science of recent development and our knowledge of it consists chiefly of a great volume of insufficiently correlated information, much of which is pure theory. There are more things unknown than known about immunology and this lack of definite and systematised knowledge on several questions connected with it has made the study of the subject all the more alluring. For after all you will admit that, human nature being what it is, has always a special attraction for things new, for things imperfectly understood, and for things hidden. I, therefore, feel confident that the subject of immunity will interest you all alike.

That a protective mechanism exists for guarding the human body from the ravages of disease was recognised centuries ago. In ancient China and India the people had made the simple observation that a person who has recovered from an infectious disease, such as smallpox, is thereafter resistant to reinfection by the virus of the same disease. Thucydides in Greece had also made somewhat similar observations with regard to the plague. But none of these people tried to explain or understand the nature of the protective mechanism involved in this process. A few centuries later Jenner made the remarkable discovery that inoculation with cowpox protected against smallpox and introduced vaccination with calf lymph as a method for preventing the disease. Then came Pasteur and his monumental work on rabies. He found that the spinal cords of rabbits dying of experimental rabies gradually lost their virulence when dried, and that emulsions of these dried cords when inoculated into human beings, bitten by mad dogs, protected them from hydrophobia and death. These two discoveries in fact laid the foundations of the science of immunology and indicated the far-reaching importance of a study of its problems. Then came Metchnikoff with his phagocytic theory of immunity and Ehrlich with his humoral theory of immunity. While the one claimed that certain cells of the body were responsible for the overcoming of disease, the other maintained that certain constituents of the blood serum and body fluids were the chief agents of protection. The story of the ardent contest between these two champions is quite familiar to most of you. All that I need to tell you now is that to the modern immunologist this classical controversy has lost all its pristine interest and significance. To him it is but an important landmark in the history of immunology—a landmark that served as a very effective stimulus to both experiment and criticism. One direct outcome of this heated controversy was the discovery of a series of new serological reactions such as the

agglutination reaction by Gruber and Durham, the precipitation reaction by Kraus, the complement-fixation reaction by Bordet and Gengou and several such others. Side by side with these discoveries the value of immune sera in the treatment of certain infectious diseases, like diphtheria and tetanus, were being demonstrated and explanations for the various serological reactions, and the beneficial effects of antisera in treatment were being sought. Very soon Ehrlich came forward with his ingenious chemical theory of immunity, with its fascinating side chains and receptors and it was accepted practically by everyone with awe and reverence. Then came Bordet. He recognised the close similarity between the immunological reactions and the reactions of colloidal chemistry and put forward his physical theory to explain the various serological phenomena. His experiments showed that immunological reactions followed the laws governing the phenomena associated with adsorption at surfaces and interfaces, and as such were subject to physical rather than chemical laws. This theory has only one great shortcoming and that is, it fails to explain adequately the specificity of the immunological reactions. More recent studies, however, show that a correct explanation for all the serological phenomena noted is possible only by a combination of the physical and chemical theories of immunity and assuming a primary colloidal adsorption and a secondary chemical union. Last of all comes the work of Loeb on the behaviour of protein solutions, and the investigations of Landsteiner and Pick on the chemical structure of protein molecules and their relation to immunological specificity. These important researches that are being conducted at the present time bid fair to throw more light not only on our knowledge of immunity reactions but also on the chemistry of proteins which is at present very little understood.

Having outlined the historical development of our knowledge regarding the defence mechanism of the human body, let me tell you something about it from the evolutionary point of view. In the long course of evolution of living things, it seems probable that the lower forms of life arose far in advance of the more highly differentiated forms. So much so that the latter from the very moment of their first appearance on this earth had to compete for their place in nature with a vast number of microbial forms. In the course of the adjustments necessitated by this complex communal existence various forms of parasitism were established. As a defence against parasitism and the abnormal conditions arising from it, mechanisms of protection of different degrees of efficiency were developed. Even in the most primitive forms of life one or more simple means of self-defence are discernible. Higher up the scale as the needs for self-preservation grow greater, the mechanism of defence also becomes more and more complex, and when we reach man we find that this mechanism is very intricate and very difficult to understand. By way of illustration let me outline the course of development of the defence mechanism from the lowest to the highest animal.

Take a unicellular animal like the amoeba, and give it to eat a red blood corpuscle and a carbon particle. It takes up both, but it very soon rejects the carbon particle and digests the red blood corpuscle. By repeating this experiment several times it has been shown that the amoeba can be trained not to take the carbon particle at all. This then is the simplest form of defence mechanism and is just an adaptation of the ordinary feeding mechanism.

Next let us take a simple multicellular animal such as the hydra or the sea anemones, here we find that certain cells of the mesenteric filaments do exactly the same thing that the amoeba does. The only difference is that being a multicellular animal, there is division of labour and that to certain special cells have been relegated the power to deal with animate and inanimate particles that are swept into the interior of the animal and to dispose of them in the way best suited to the interest of the animal.

Next passing to the daphnia or the water flea which is still higher up in the evolutionary scale, the defence mechanism is found to be principally a phagocytic one. When you place this minute aquatic animal in water containing Monospora or yeast cells and observe it under the microscope you can see the spores penetrating the wall of the intestinal canal and making their way into the body cavity of the animal. Here they are attacked by certain wandering phagocytic cells which first engulf them and later digest them completely. This prevents the proliferation of the parasites within the body cavity of the daphnia and the infection is soon overcome. If, on the other hand, the arrival of the phagocytic cells to the focus of infection is delayed or their phagocytic and digestive powers are interfered with, then the spores rapidly proliferate and a generalised infection results leading to the speedy death of the daphnia. In this aquatic animal again we find that phagocytosis is the principal factor in the overcoming of its infections.

When next we take the lower cold-blooded vertebrates, we find that their mechanism is somewhat similar to that in the daphnia. If for instance we inject into these animals a culture of *Bacillus anthracis*, they respond to it by a local accumulation of wandering phagocytic cells which rapidly ingest and digest the bacilli.

Finally when we take up the study of the mechanism of defence in the warm-blooded vertebrates, we find that it is essentially the same as in the less complex forms, but that in addition several other mechanisms are also involved. Details of these mechanisms have been worked out in animals such as guinea-pigs, rabbits and dogs by injection of various substances into them, and our knowledge of the mechanism in man is to a large extent derived from these experiments. As our chief interest lies in the understanding of the defence mechanism in man let me take it up next for detailed consideration.

The defence mechanism of the human body is something like a motor engine. It is composed of several parts and in order to understand how the mechanism as a whole works one has to know first what the parts are and then how each part functions. Of the component parts, there are three, that are relatively more important than the rest, namely, the phagocytic mechanism, the antibody mechanism, and the anaphylactic mechanism, and these three alone need be considered here.

In the blood and tissues of man there are certain phagocytic cells usually spoken of as polymorphonuclear cells, and the wandering cells of the reticulo-endothelial system which have retained the primitive capacity for intracellular digestion. Both these cells have a very wide distribution throughout the body and their chief function is to pick up all foreign particles animate and inanimate that gain access into the body and to destroy or dispose of them in a suitable manner. They are both provided within their cytoplasm with proteolytic ferments that are capable of digesting proteins to the amino-acid stage. Depending upon the nature of the invading organism one or the other of these two cells assumes the rôle of phagocytosis and destruction. For example when the infecting agent is a pyogenic coccus like the staphylococcus, then the polymorphonuclear leucocytes play an important part in their destruction; but if the agent is a protozoon like the malarial parasite then the cells of the reticulo-endothelial tissue play the predominant part. The latter cells appear to be concerned chiefly with the removal of those foreign particles that are somewhat difficult to destroy or digest. This partly explains why we get different types of cell reactions in different infectious diseases and why the medical man studies the number and distribution of blood cells to find out the probable nature of the disease.

It is not to be supposed that in every instance the phagocytes are successful in destroying the parasites they pick up. At times even growth and multiplication of the ingested organisms take place within the phagocytic cells. When such cells die, the living organisms

contained in them are liberated and cause an infection of the tissue in which they chance to be deposited. This shows how infection is carried from one tissue to another and how the phagocytes prove at times harmful instead of helpful. It can be shown by simple test tube experiments that one of the factors that prevent such occurrences and help the phagocytes to perform their destructive function better and more efficiently, is the antibody mechanism. If for example phagocytes are washed free of serum, mixed with certain bacteria, and examined under the microscope, very few phagocytes will be seen to have taken up the bacteria. If next we add to this mixture a small quantity of fresh normal serum then we can see a relatively larger number of phagocytes taking up the bacteria. But if instead of normal serum we add immune serum, that is serum containing specific antibodies for the bacteria then not only can an enormous number of phagocytes be seen with bacteria in their cytoplasm but several of the bacteria contained within the phagocytes are found to be in various stages of disintegration. This shows that in the presence of antibodies large numbers of bacteria are taken up and successfully destroyed by phagocytes and that phagocytosis represents only one part of the story and to get a complete picture of immunity we will have to consider other mechanisms as well.

One of the interesting problems in connection with the phagocytes is the mechanism of phagocytosis. The question is how do the phagocytes take up particulate matter from their environment? Is it a process analogous to ingestion by the relatively highly developed organisms involving a definite expenditure of energy or is it a process involving decrease of free energy? That is to say does the phagocyte ingest substances because of surface tension or in spite of it. The researches conducted so far show that surface tension is only one of the factors concerned in phagocytosis and that possibly other factors also play a part.

Next we come to a consideration of the antibody mechanism. This mechanism owes its existence to the fact that certain tissue cells of our body have the power to respond in a specific way when substances of a given chemical and physical structure gain an entrance into the blood or tissues. That is to say when certain protein substances called antigens are injected into our blood or tissues there appear after a time in the circulating blood certain substances called antibodies which specifically react with the injected antigen when the two are brought together. Remembering that the ætiological agents of infectious diseases are composed of protein substances which possess this antigenic property, it can easily be understood how readily they can stimulate antibody production.

When pathogenic organisms gain access to our bodies antibodies are formed. Each antibody produced is specific for the organism that stimulates its production. If in one and the same organism there are more than one antigenic substance then antibodies will be formed against each one of these substances and if the organism is a toxin producer then antibodies will be produced against the toxin as well. Thus for one organism there may be produced more than one antibody and each antibody will react only with the antigenic substance that stimulated its production. It is this extreme specificity of the antigens and antibodies that has made immunology a very interesting subject for study. Recent investigations show that this immunological specificity is a function of the chemical structure of the particular protein antigen.

Efforts have been made to isolate antibodies in a pure state, but so far no success has resulted. Therefore, we do not possess any definite knowledge regarding their chemical nature or structure. All that we know about them is that they are associated with the globulins of the blood plasma, and that their presence can be demonstrated by certain serological tests. For example if we mix serum containing antibodies with the organisms that stimulated its production in the presence of electrolytes in a test tube, then the organisms can be seen to clump together and settle down to the bottom

of the tube. What happens is that the organism adsorbs the antibody and becomes very sensitive to the presence of electrolytes. The latter bring about a reduction in the electrical charge on the surface of the organism with the result that the cohesive force between the individual organisms is increased, the organisms clump together and finally settle down to the bottom of the test tube. The above phenomenon that occurs in the test tube has experimentally been shown to take place inside the animal body and it is this phenomenon that is responsible for the increased success of the phagocytes in destroying organisms in the presence of antibodies.

Attempts have been made to find out where and how the antibodies are formed. Although there is no definite information on the subject it is supposed that antigenic substances when introduced into the body are picked up by phagocytic cells and taken to the spleen and liver and deposited there. Here certain cells of the reticulo-endothelial system are stimulated by these substances in such a way that specific antibodies are produced. When the amount of antibodies produced reaches a certain concentration, they begin to appear in the circulating blood.

The rôle of circulating antibodies in immunity has also been studied very extensively. Taking the evidence as a whole it appears that whenever a disease is due to the toxins of an organism rather than to the organism itself then an increase of antibody in the circulating blood means an increase of protection. In diseases like diphtheria and tetanus where the damage is caused chiefly by the toxin of the organism, marvellous results can be achieved by the use of serum containing antitoxic antibodies. This is so because all that is required to overcome the disease is to neutralise the toxin. The antitoxin does this perfectly and in proportion to the amount available. The greater this amount, the better the neutralisation and the better the immunity. The relation between antitoxin and immunity is similar to the relation between the quantity of petrol in a motor engine and the distance travelled; just as you can go a longer distance with more petrol than with less, you can cure cases better with more antitoxin than with less.

On the other hand in diseases that are directly due to the multiplication of the invading organisms, it is found that increase of antibody in the circulating blood does not necessarily mean increase of immunity. This is so because the function of antibodies in these diseases is only to prepare the organisms for phagocytosis and other destructive processes, and unless the latter processes are efficient, antibodies by themselves will not be of much use. For preparing the organism for phagocytosis only a limited amount of antibody is required and when more than this is present it will not be of any additional benefit. This explains why in diseases like pneumonia administration of serum containing antibodies to the patient is of very limited value. The best way to understand the true rôle of these antibacterial antibodies is by taking the analogy of the engine again. Antibodies as I said before correspond to the petrol; more petrol in the tank does not mean more efficiency or speed; some petrol in the tank is certainly better than no petrol, but a full tank is surely not better than a half tank. The same is true of this type of antibody.

Finally we come to a consideration of anaphylactic immunity. In some cases the antigenic substances liberated from parasitic organisms within the body act by increasing the reacting capacity of the body cells in such a way that even when a very small amount of the same antigen is introduced at a later date, the body responds by a violent reaction. This form of immunity is best illustrated in connection with tuberculosis. If, when a person has a mild tuberculous infection, we inject into his skin a small amount of an extract of tubercle bacilli, he will react with a violent inflammation; but the same dose of extract when injected into a healthy person produces no such reaction

whatsoever. This difference in response in the two persons is because in the first individual the infection with tuberculosis has brought his body cells to a state of great sensitiveness or irritability, and is thereby preventing any further entry of the same organism. This peculiar protective mechanism functions only so long as the primary infection that causes it lasts. It is, therefore, sometimes called 'infection immunity' because the immunity is present only when the infection is present. In those diseases where this is the chief type of immunity concerned, it is better to have a mild infection of the disease well under check than to be completely free from it, for in the first case one will be immune to fresh doses of infection and in the second one will not be.

Having explained to you the three chief component parts of the defence mechanism, I wish to point out that every case of cure and immunity cannot be explained away purely on the basis of these mechanisms. There are occasions when one is at a loss to find an explanation for the immunity that has occurred. There are as many cases on record of protection in the absence of demonstrable antibodies as there are of absence of protection in the presence of antibodies. These have naturally led immunologists to recognise that possibly there are other mechanisms concerned in protection as well. Recently Besredka has put forward his new and interesting theory of local immunity in an attempt to explain some of the observed discrepancies. His theory supposes that the cells of the tissues attacked are the cells primarily concerned in protection and not antibodies or phagocytes. Besredka says 'the antibodies should be without hesitation stripped of their importance as their function in immunity is in reality entirely secondary or negative in certain cases'. He supports this assumption by the following line of arguments. Many pathogenic organisms have a tendency to get localised in some one particular tissue of the body, irrespective of the route of entry of the organisms. For example the typhoid and dysentery bacilli attack the intestines and anthrax bacilli the skin. If these tissues are rendered insusceptible to attack, then the whole animal will be immune. Therefore what is to be aimed at is not the production of antibodies or phagocytes but effective local tissue immunity. He thinks that this can be done by introducing the virus of disease in a particular form directly into the tissue concerned, and by stimulating the production of 'anti-virus'. This anti-virus saturates the tissue cells and renders them insensitive to the toxic action of the organisms. Taking the available evidence as a whole, there appears to be some support for the view that local tissue immunity as opposed to a general cellulo-humoral immunity plays some part in resistance to bacterial infection; but there is little or no reason to believe that the mechanism involved in this immunity is in any way different from what we have already considered. For, when local immunisation is pushed to a point at which general resistance is markedly increased it is always possible to demonstrate the presence of protective antibodies. Therefore, while admitting that the method of vaccination advocated by Besredka is good, most immunologists do not accept his theory of local immunity, as sound.

By way of conclusion I may add that in presenting the subject of immunity in the manner I have done, it has been my endeavour to show how the problems of immunity are of interest not only to the medical man, but to workers in other branches of science as well. As I told you in the beginning the unsolved problems in immunology are numerous and the subject-matter of these problems lies on the border line between different branches of science. No solution of these problems is possible unless it be through team work or the willing co-operation of specialists in the various branches of science. Therefore there is no better way of concluding this lecture than by an appeal for such a co-operation. In doing that I am sure I will also be indirectly appealing for the success of this academy under whose auspices we have met here to-day.

THE CLASSIFICATION AND GRADING OF DIFFERENT QUALITIES OF INDIAN RICES IN CONNECTION WITH THE EPIDEMIC DROPSY PROBLEM*

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RICES may be classified from four different stand-points:—

- (i) The quality of the rice, as judged by the fineness of the grain.
- (ii) The process through which the rice grain has passed in its removal from the paddy.
- (iii) The digestibility of the rice—from seasoning.
- (iv) Its vitamine content.

With regard to quality, the best rice is transplanted rice, reaped during the winter months—the *aman* crop. Grain of the *aus* crop is coarse and not of good quality.

Fine rice is very slim; it may be small, medium or long in size, and the finest rices have long, slim grains. Typical fine rices are the *basmathi*, *baspathi* and Peshawar rices. Medium grade rices are stouter in grain, and may be small, medium, or long; typical examples are Patna, *balam* and *deshi* rices. The coarse grades of rice are all small, squat and thick in grain; typical examples are Nagri, *aus* and *sal sathi* rices. In *atap* rice the coarse grains are opaque and dull white in colour, the best grains being semi-translucent and waxy in appearance. In *siddah* rices the coarse grains have a dull horny appearance, whilst the better grades are more transparent.

It is easy to judge the quality of a rice under the microscope. The fine rices have small granules in fine packets, with a delicate cellulose envelope; coarse rices have larger granules in larger packets and a coarser envelope with knots.

With regard to methods used for loosening the husk from the rice, the best rices are sun-dried, *atap* rice. The finest rices, such as are used by Brahmins in ceremonial rites, are steeped in cold water for several hours, and then sun-dried. Patna rice is treated in this manner. The *bapa* rice of Burma, which is of good quality, is steeped in hot water. *Siddah* rices are parboiled in the villages by the poorer classes, steamed in the mills, and steeped in boiling water in Upper India. Practically all middle grade and coarse rices are treated in this way.

Removal of the husk is carried out either by hand, as in the villages—*dhenki* rice, or more usually by machine milling—*chutkal* rice. The first milling removes the husk and the rice is seen as silver rice with a white pericarp—the best grades; red rice—with a red pericarp; or black rice—with a purple pericarp. The second and third milling removes almost all of the pericarp, but leaves a good deal of the aleurone layer behind. Simple hulling, being cheaper, is generally used for the coarser and middle-class grades.

Polishing is chiefly done for appearance. The finest grades of rice are hand-polished, the coarser and medium grades of Burma and Patna rice being polished by machinery.

Digestibility of the rice is determined by the quality of the grain and its seasoning. The best grade rices are carefully preserved, changed into new bags every year after cleaning, and are kept for from one to ten years or more before being consumed. Medium grades of the *aus* crop are hulled three times, kept for a few months, and then sold. Coarse grained rices are hulled once or twice and sent out according to the market demands.

The vitamine content of the different rices can be estimated by cutting sections and examining them

* Being a résumé of a lecture, accompanied by a demonstration, given on 19th August, 1932, to the Health Officers of the Calcutta Corporation.

microscopically, by colorimetric tests, and by experimentally feeding birds on them. Parboiled rice has a high vitamin content, *atap* rice has a much lower content, whilst washing removes a great deal of the vitamins.

The different grades of rice are used by different communities. Coarse polished *atap* rice is eaten by the Burmese, South Indian, Chinamen, the Japanese, and Filipinos. When decomposed by bacterial infection, with its concomitant production of toxins, this rice causes beriberi—the toxins being soluble in alcohol. It is this grade of rice which is responsible for the beriberi of Burma. *Siddah*, once or twice-hulled village or town rice, which has not been stored for any length of time, usually causes no disease. Medium grade *siddah* rice, which has been twice or thrice hulled, not polished, and stored for a short time is the rice of the *bhadra* log, and when diseased causes epidemic dropsy, as seen in Bengal, the United Provinces, Burma and the Northern Sircars. The toxin of this disease is water-soluble, and it can be isolated in a pure state, when its pharmacological actions on the skeletal and heart muscles produce the typical symptoms of the disease.

Polished *atap* rice, freshly milled, is used chiefly by Europeans, Marwaris, and Anglo-Indians. This rice does not cause disease. The smaller grained varieties, not so carefully preserved and often stored—a cheaper rice—are often used by the poorer classes of Anglo-Indians, Hindu widows, etc. When diseased these may cause either epidemic dropsy or beriberi. The fine grades of polished *atap* rice are eaten only by the upper classes, being usually preserved for ceremonial rites, for Brahmins, etc. These cause no disease.

If not properly stored, and exposed to damp and heat and not properly ventilated, *atap* rice rapidly deteriorates. This is the 'old rice' of Braddon, which he found to be responsible for epidemics of beriberi in the Federated Malay States. Deterioration, due to bacterial infection and the production of toxins, occurs chiefly with a wet-bulb temperature between 80° and 82°F., and a humidity of 60 to 90 per cent.

Diseased rice can readily be detected by soaking it in water or glycerine. Weevil attack—due to the larvae of certain beetles and moths—can be detected by tunnels bored in the rice, and by the grains floating to the surface. Moth attack shows adherent cocoons. Bacterial decomposition, the cause of both beriberi and epidemic dropsy, can be detected by the change of colour in the diseased grains to a white opacity in place of the waxy translucency of healthy rice. *Aspergillus* infection will cause mouldiness of the rice. 'Brushings' are frequently added to rice; these are pieces of broken up diseased rice which have been re-hulled and mixed with good rice.

Medical News

BIRTHDAY HONOURS, 1932

We regret that the following name was inadvertently omitted from the list of names of recipients of Birthday Honour which appeared on p. 395 of our issue of July 1932.

To be Khan Sahib

Dr. Mohammed Ali (Madras cadre), attached to the King Edward VII Memorial Hospital, Secunderabad, Deccan.

INTERNATIONAL MEDICAL POST-GRADUATE COURSES IN BERLIN

We have been informed that the following courses under this association will be held in the spring of 1933. Course in internal medicine held by the Clinic of von Bergmann.

Course in ophthalmology. Course in surgery. X-ray course. Course in skin and venereal diseases. Pediatrics. Practical and theoretical medical post-graduate work in English all the year round.

The information bureau of the Kaiserin Friedrich-Haus, Berlin, N.W. 7. Robert Koch-Platz 2-4 gives information on all questions relating to the above.

THE BULLETIN OF HYGIENE

A new feature in the *Bulletin of Hygiene* for August 1932 is the section at pp. 477 to 481 dealing with 'Conventions, Laws and Sanitary Regulations: National and International'. It is thought that this section, which will appear regularly in future, will fulfil a useful purpose by enabling medical officers and others to keep themselves informed of important sanitary enactments at home and abroad, thus providing a means of comparing and appraising the value of the practice in their own and in other countries, which often differ considerably.

THE LEISHMAN PRIZE

MAJOR D. T. RICHARDSON, M.C., Royal Army Medical Corps, has been awarded the Leishman Prize (Officers) for the year 1931, consisting of a silver medal and a sum of £30, for his work in the interests of military hygiene.

The Leishman Prize (Officers) is awarded annually for the best piece of work in any branch of medicine, surgery, or allied science, or in connection with the general duties of the Royal Army Medical Corps, by an officer of the Royal Army Medical Corps, or Army Dental Corps, or by an officer removed from either of these Corps but still on the active list.

NORTH PERSIAN FORCES MEMORIAL MEDAL

DR. NEIL McLEAN, Colonial Medical Service, has been awarded the North Persian Forces Memorial Medal for the year 1931 for his paper on 'A Sleeping Sickness Investigation in the Infected Areas of Kavirondo (1930-1931)', published in the *Kenya and East African Medical Journal*, Vol. VIII, No. 7, October 1931, pages 180 to 199.

The North Persian Forces Memorial Medal is awarded annually for the best paper on tropical medicine or hygiene published in any journal during the preceding twelve months by a medical officer of under twelve years' service, of the Royal Navy, Royal Army Medical Corps, Royal Air Force, Indian Medical Service, or of the Colonial Medical Service, provided the Memorial Committee consider that any of the papers published has attained a standard of merit justifying an award.

WILLIAM GIBSON RESEARCH SCHOLARSHIP

WITH reference to the notice regarding the William Gibson Research Scholarship for medical women awarded by the Royal Society of Medicine which recently appeared in our columns the Council has awarded the Scholarship to Dr. Audrey E. Russell of the Institute of Anatomy, University College, Gower Street, London, W.C. 1.

Dr. Russell proposes to carry out research on the 'Physiology of lactation and the factors promoting successful lactation in women'.

Eleven candidates from all over the British Empire submitted applications.

QUARTERLY BULLETIN OF THE HEALTH ORGANISATION

We have been asked to announce the publication of a new periodical by the League of Nations entitled *Quarterly Bulletin of the Health Organisation*. We are informed it is intended to publish in it reports on the Commissions dealing with important health and social problems, e.g., tuberculosis, malaria, rabies, health of school children, etc. Volume 1, number 1, issued in March of this year, consists of 157 pages. It is printed in English, and the price is 7s. 6d. per annum or 2s. per copy.

Current Topics

Dr. Boot's Non-Surgical Treatment for Swallowed Foreign Bodies. (A Posthumous Report on the Method)

By L. W. SAUER, M.D.

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ON 1st September, 1927, Mary J., aged 7 years, accidentally swallowed a twenty-five cent piece (quarter-dollar). Its passage into the stomach was accompanied by much discomfort and pain. The pain was most intense below the sternum. After the coin passed the cardia, relief was instantaneous. Fluoroscopic examination about two hours later showed the coin in the fundus of the stomach. As there were no symptoms, I asked the mother to notify me if any distressing symptoms arose; otherwise, to report when the coin was passed. Three days later, fluoroscopic examination showed that the coin had not left the fundus. There were no symptoms. The child had eaten three hearty meals each day and had had a daily evacuation. Six days after the accident, the coin was still in the fundus. Nine days after the accident, fluoroscopic examination showed the coin still in the fundus. The mother was now quite concerned but, owing to the absence of symptoms, was willing to wait longer. On the following day I spoke to a noted abdominal surgeon about the case. He felt certain that the coin was too large to pass the pylorus. He recommended surgical removal. I then conferred with the late Dr. George W. Boot, who had on numerous occasions removed foreign bodies from the trachea, bronchi and lungs of children.

He said: 'Have the child eat a good-sized bowl of mixed vegetables—cabbage, green beans and celery. The vegetables should not be cooked soft, and should be swallowed without much if any mastication. Wash them down with a little water if necessary. Give no laxative'. His orders were carried out without delay. Within twelve hours after the first bowlful of vegetables had been eaten, the coin was passed by rectum. Dr. Boot suggested, at the time, that the case be reported. In the interim, seven other children have been treated by the same method for swallowed foreign bodies—open safety pins (one rather large, two medium sized), three cases; five-cent piece (nickel), one case; small pocket knife, one case; tack, one case; penny, one case. Doubtless many small objects will pass through the intestine without resort to the coarse vegetable diet, but the prompt passage of the twenty-five cent piece, which had remained in the stomach for ten days, warrants a trial in any uncomplicated case of swallowed foreign body.

The Results of One Thousand Aschheim-Zondek Tests for Pregnancy

By RAPHAEL KURZROK, Ph.D., M.D.

(Abstracted from the *New York State Journal of Medicine*, June 15th, 1932, Vol. XXXII, p. 711)

IN a recent review of the literature on the Aschheim-Zondek test for pregnancy, Zondek collected a total of 5,515 cases. The present report covers 1,000 tests which were carried out under the supervision of the writer, who personally made all examinations of the ovaries. The error in diagnosis in Zondek's collected series was from one to two per cent. In the writer's series the error amounted to 1.2 per cent. Four hundred and sixty tests were positive, and five hundred and forty were negative.

The technique used in this present research followed closely the one originally advocated by Aschheim and Zondek. Six injections of 0.25 c.c. of morning urine

were given over a period of three days, and all animals were sacrificed one hundred hours after the first injection. If the urine appeared to be contaminated, or if the mice appeared to be ill after a single injection, the urine was shaken with an equal volume of ether, the ether discarded, and the urine injected in the usual manner. Six mice were used for each test. A test was never reported as negative unless there remained at least three mice for autopsy, the ovaries of all of which were distinctly negative. If a single mouse gave a positive reaction the test was considered positive.

The indications for the test were those usually found in a large obstetrical and gynaecological service. The cases included hydatid moles and two chorioepitheliomas. They will be considered in a separate publication. Interesting as were the number of correct diagnoses, the cases in which the test failed were, to us, more interesting. The failures may be divided into two groups—incorrect positive (2 cases) and incorrect negative (10 cases).

(A) CLINICALLY FOUND NOT PREGNANT—A-Z TEST POSITIVE (2 CASES)

Case 1.—This patient had been receiving injections of Prolan for several weeks prior to the test. The ovaries showed corpora lutea but no punctate hæmorrhages. Microscopic examination of the curettings failed to reveal a pregnancy.

Case 2.—This case was one of multiple fibroids, menopausal symptoms, and amenorrhœa for seven weeks. The ovaries of the test mice showed corpora lutea but no punctate hæmorrhages. The patient was curetted and the physicians reported that the macroscopic examination of the curettings failed to reveal a pregnancy. No microscopic examination.

(B) CLINICALLY FOUND PREGNANT—A-Z TEST NEGATIVE (10 CASES)

Case 3.—Multiple fibroids and four months pregnant. The test was repeated one month later and a weak positive reaction was obtained.

Case 4.—Pulmonary tuberculosis. Menstruation ten days overdue when the test was done. Curettage revealed an early pregnancy.

Case 5.—Cardiac disease with beginning decompensation. Menstruation 11 days overdue. Curettage and microscopic examination of the curettings revealed an early pregnancy.

Case 6.—Menstruation 5 days overdue. The test was repeated two weeks later and a positive result obtained. The pregnancy was later confirmed clinically.

Case 7.—Menstruation one week overdue. The test was repeated three weeks later and found positive. Clinically confirmed.

Cases 8, 9.—The menstrual periods were 10 days overdue. Subsequent tests were positive in each case.

Cases 10, 11, 12.—These cases occurred early in our series. On macroscopic examination of the ovaries of the mice we were unable to interpret the findings correctly. The results were probably due to faulty technique. In the light of our present knowledge some explanation may be offered for the failure of the test to correspond to the clinical facts in some of these cases.

Case 1.—This patient, with oligohypomenorrhœa, had been receiving two to four hundred rat units of Prolan intramuscularly each week for a period of several months. We believe that there is a definite renal threshold for Prolan and that some of the injected hormone, in this case, was excreted in the urine. Since the Prolan that we used contained both the follicle-stimulating hormone and the luteinizing hormone, in a ratio of about 9 to 1, it is quite likely that the urine when injected into the mice produced both ripening and luteinization of the follicles. The finding of the corpora lutea we interpreted as a positive result for the test.

Case 2.—While it is quite likely that the physician was correct in his macroscopic examination of the curettings these were not examined microscopically. A

thickened endometrium could be easily mistaken for an early decidua.

Case 3.—We have no reasonable explanation to offer for the negative test at the first examination and the weak positive reaction at the second test one month later. Both tests were done during the second trimester of pregnancy. The patient went to term and both child and placenta were normal. No errors in technique could be detected.

Cases 4, 5, 6, 7, 8, and 9 can be considered together. In these patients menstrual bleeding had failed to appear for five to ten days after the expected time. Our earliest positive test was in a patient in which the flow was one day overdue. We have never had a positive test before a patient had passed her regular period time. The factors determining the time of first appearance in the urine of the follicle-stimulating and luteinizing hormones (possibly also a haemorrhagic hormone responsible for the punctate haemorrhages or 'Blutpunkte') are not known. Some theoretical considerations are, however, of some interest. Two factors which may greatly influence the time are the date of implantation of the ovum and the renal threshold for the hormones.

According to the most recent views of Fraenkel, spontaneous ovulation occurs between the 15th and 18th day after the onset of the last menstrual period. Fertilization probably occurs within 24 hours, and then migration of the fertilized ovum begins. The duration of the migration (according to a recent review of the facts by Grosser) is from 10 to 14 days, two-thirds of this time being spent in the tube, and one-third in the uterine cavity. Then implantation occurs. In a woman with a 28-day cycle this would take place slightly after the normal time for the onset of the next menstrual period and would correspond to the time of our earliest positive test.

On the other hand, Grosser places the limits of spontaneous ovulation between the second and the twenty-fourth day of the menstrual cycle. This opinion is based on the study of a fairly large number of very young embryos. Furthermore the statistics of Siegel, Pryll, Jaeger, Zangemeister show that the optimal time for conception lies between the 6th and 10th day following the onset of the menstrual period. We may assume that the ovum remains fertilizable for only 24 hours, and that the fertilization power of the sperm is about of the same duration. If in any instance ovulation occurs early in the menstrual cycle, for example, on the 6th day, we may add to this the average time of migration of the fertilized ovum, 12 days, and reckon the 18th day as the time of implantation. Such a case may give a positive A-Z test several days before the expected failure to menstruate. If, however, ovulation takes place on the 24th day, and we add 12 days as the average period of migration, implantation would be expected to take place about 8 days after the normal time for the menstruation. Our cases of failure of the A-Z test within 10 days after the expected onset could therefore be explained on the basis of such late ovulation.

Still another factor that could vary the time of ovulation, and hence, of implantation, would be the possibility of an induced, provocative or violent ovulation, induced by coitus or possibly by emotional stress or drugs. This type of ovulation is known to occur in the rabbit and in the cat. Heuser was the first to suggest this possibility in the human. Grosser, Chazan, Zangemeister, R. Meyer, Fraenkel, Triepel, Thomson and V. Moellendorff have also considered the possibility of induced ovulation.

We are accumulating some evidence that would seem to show a definite renal threshold for estrin and prolan A. It is very likely that prolan B may also have a renal threshold value. Patients with a high renal threshold would spill these hormones into the urine later than those with a low renal threshold and in this way the time of appearance of a positive A-Z test might vary.

In addition to the 1,000 A-Z tests reported, there were six positive tests of special significance in the

study of sterility. The cases came from our Sterility Clinic. In each of these cases the test was positive within a few days after the expected time of onset of the skipped menstrual period. In these cases, normal menstrual flow appeared before the tests were completed. The periods were normal in every respect. The tests were repeated later and found negative. This small group of cases would tend to support the view that some 'sterile' women become pregnant, but that for some unknown reason the embryo dies at a very early age.

Focal Sepsis as a Cause of Nephritis

By A. C. ALPORT, M.D. (Edin.), M.R.C.P. (Lond.)

(Abstracted from the *Lancet*, June 11th, 1932, p. 1247)

It can reasonably be held that there is probably a toxic factor at the root of all cases of Bright's disease. This is well seen in the acute types which follow the acute infective fevers, particularly scarlet fever and diphtheria. Damage to the glomeruli, followed by tubular degeneration, is also caused by the toxins of pregnancy and secondary syphilis, and by tonsillitis and certain chemical poisons. But what we fail, as a rule, to recognise is the fact that in those cases in which there is a transition to the subacute and chronic stages of nephritis there is often a secondary or residual focus of infection in the tonsils, antra, sinuses, teeth, or perhaps the intestines, which may account for the failure of the acute renal condition to subside completely. Moreover, cases of subacute nephritis with marked oedema and albuminuria, and the semi-chronic varieties with less oedema and albumin in the urine, but with some urea retention and cardiovascular changes, are often the result of focal sepsis. These cases usually begin insidiously; their rate of progress varies and, unless the focus of infection is recognised and eradicated at an early stage, a progressive deterioration may occur which sooner or later ends in the death of the patient from pneumococcal infection of the oedematous tissues or from renal or cardiovascular failure.

From the point of view of organismal infection of the kidneys, Rosenow's work on the elective localisation of streptococci suggests that oral sepsis may be the focus of infection of bacteria having selective affinity for the urinary tract. Bumpus and Meisser have described swelling and areas of haemorrhage and necrosis in the medulla of the kidneys of rabbits after intravenous injection of streptococci from infected teeth or tonsils.

Hartzell and Henrici produced definite suppurative changes in rabbits after inoculation with streptococci, but did not describe anything indicating chronic interstitial nephritis. The presence of chronic inflammatory or degenerative changes, however, would necessitate a long-continued infection, which is difficult to produce in an animal; thus experimental evidence of toxæmic kidney is not very conclusive. In the course of research on streptococcal injections in rabbits, I found albumin in the urine of four of the animals which developed pyæmic joints but recovered under treatment with fixation abscesses.

The effect of a toxin upon the kidney depends: (a) upon its virulence; (b) upon the length of time it continues to be excreted, and thus is able to excite degenerative or inflammatory reaction; and (c) upon the resistance of the kidney tissues to toxic action. Although the subacute type of nephritis is the more likely to result from a toxin of comparatively low virulence passing through the kidney over a prolonged period, it is possible that even the very chronic cases, which commence insidiously and do not appear in the consulting-room until marked contraction of the kidneys has occurred, may also be due to this cause.

If in a case of nephritis the tonsils or antra are found to be infected, and if these are promptly and efficiently dealt with by surgical means, a definite cure may result. I have also treated cases of oedema and albuminuria with vaccines made from hæmolytic and viridans streptococci obtained from the stools, but although

temporary improvement took place there was always a return of the albuminuria. In all these cases, however, a further examination by the ear, nose, and throat department and by x-rays showed infected tonsils or antra. These patients have since been operated upon, and the results obtained will be referred to later. Vaccine treatment is thus only worth trying in cases in which there is definitely no focus of infection in the mouth or sinuses or in which the removal of a focus of infection is an impossibility.

It is by no means uncommon also to find albumin in the urine of young persons who are being examined for life insurance or for posts in the Civil Service, banks, and other institutions. Usually there is no history of previous kidney trouble or any infectious disease to which the albuminuria can be attributed. Apart from functional albuminuria, a proportion of these cases may be due to focal sepsis, and no pains in my opinion should be spared to eliminate its possibility as an ætiological factor; failure to do so may result in some form of nephritis at a later date.

Reduction of œdema before operation in cases of nephritis

Massive doses of urea are necessary for this purpose, and can be given without any ill-effects. It is customary to give 20 g. every four hours until the œdema disappears. Experimenting upon a normal person I found that by giving 30 g. of urea every four hours for 12 doses the blood-urea rose from 28 mg. to 208 mg. per 100 c.cm. after the final dose, and fell to 54 mg. per 100 c.cm. 30 hours later. The amount of urine passed, on an average, in 24 hours, whilst taking this dosage was 3,773 c.cm. (133 oz.), nearly three times the normal output.

Vaccine treatment in nephritis

Vaccines should be tried only in cases in which surgical interference is impossible, e.g., in streptococcal excess in the intestinal canal. The streptococci of pathological significance are usually the hæmolytic and viridans varieties. Streptococci may also be found on culturing catheter specimens of the patient's urine. In most cases, however, the urine proves to be sterile. The presence of an organism, moreover, is usually the result of contamination. A negative finding does not imply the absence of nephritis, because the damage to the kidney is due, as a rule, to a toxin and not to the direct action of the organism.

The dosage of vaccines is important: one should begin with 0.1 c.cm. of a vaccine containing 5,000,000 organisms in each c.cm., and work up, at five to seven-day intervals, to 1 c.cm. of a preparation containing 500,000,000 organisms in each c.cm. A local reaction at the site of injection, an increase of albumin or blood in the urine, a general reaction with malaise and headache, are indications for cutting down the dosage.

Vaccines have no effect in clearing up septic foci in the tonsils, sinuses, or sockets of the teeth; in these conditions an operation is essential. Moreover, the results obtained from the injection of vaccines prepared from stool cultures tend to vary so greatly that it is impossible to venture an opinion as to their real value. If a patient is treated with vaccines and the condition fails to respond, a further search should be made for dental, tonsillar, and sinus infection, and should include radiographic examination if these have not been made previously. As a last resource, the stools may be re-examined, because the disappearance of one type of streptococcus may result in the growth of another strain which has been kept down by the original organism; a fresh vaccine containing this strain would then be required for a further series of injections.

The comparative failure of vaccine therapy is one of the great tragedies of medicine, but we have not as yet, I think, touched the fringe of this type of treatment.

Comments

(1) It is an accepted fact that tonsillitis is a cause of acute nephritis. Paterson and Wyllie have shown

that 85 per cent. of cases of acute hæmorrhagic nephritis in children are due to tonsillitis or associated conditions, such as cervical adenitis and otitis media; the causal organism is usually the streptococcus, although the staphylococcus and pneumococcus are sometimes found. Acute nephritis, moreover, is very common after scarlet fever and diphtheria, conditions in which infection of the throat is one of the most prominent symptoms.

(2) I have tried to show in this article that in the vast majority of cases of nephritis of various types it is possible to demonstrate well-marked infection of the tonsils, antra, teeth, etc.; this is particularly the case in subacute nephritis with much œdema, and it is in these patients too that early removal of focal sepsis appears to give the best results.

(3) If the kidneys are badly damaged by the long-continued excretion of a more or less virulent toxin, a surgical operation, by removing the source of the latter, may tend to slow down the progress of the disease; but the best results are obtained when the tonsillar or other infection has been searched for and eradicated at a very early stage.

(4) In the very chronic cases of nephritis with high blood pressure—200 mm. of mercury or more—even if infection is discovered, it is questionable whether the benefit obtained is sufficient to justify the risk of surgical interference. One of the above patients with a blood pressure of 210/110 mm. of Hg took a general anæsthetic well during tonsillectomy, but two months later, when having some teeth extracted, collapsed during gas.

(5) It is suggested that specialist examination of the tonsils and antra be undertaken at the earliest moment in all cases of pregnancy in which albumin in the urine or other signs of nephritis appear, also in post-scarlatina, diphtheria, and other conditions in which residual tonsillar or associated infections tend to occur. Moreover, if focal sepsis is discovered it should be removed at once, as a precaution against the possibility of subacute or chronic nephritis later.

The Modern Treatment of Burns and Scalds

By W. C. WILSON, M.B., F.R.C.S.E.

(Abstracted from the *Practitioner*, July, 1932, Vol. CXXIX, p. 183)

THE clinical course of burns may be divided into the following four stages: (1) of shock; (2) of acute toxæmia; (3) of septic toxæmia; and (4) of healing. It is convenient to discuss separately each stage in regard to clinical features, pathology, principles of treatment, and results of treatment.

Stage 1: Stage of shock.—No lengthy description of the clinical features of shock is required here. The condition appears immediately or very soon after receipt of the injury, and is one of depression of all the vital functions. The outstanding characteristic is a fall of blood-pressure.

Several facts relating to shock in burns demand special emphasis. Shock, however caused, is accentuated by pain, exposure to cold, and loss of fluid from the body. A low blood-pressure, if prolonged, can cause irreparable damage to delicate tissues, such as the central nervous system. In 'initial shock' the effective blood volume is very probably diminished. The indications for treatment are, therefore, clearly to administer heat and avoid exposure, to relieve pain, to supply fluids, and to restore the normal level of blood-pressure. Experience has shown that the most effective method of raising the blood-pressure is to introduce into the circulation a colloidal solution of correct concentration, such as blood or gum saline. In burns the degree of shock bears a very close relationship to the extent of body surface involved. The extent may be described as 'small' for burns of 10 per cent. or less of the body surface, as 'moderate' for those between 10 and 30 per cent., as 'extensive' for those between 30 and 50 per cent., and 'very extensive' for those of more than half the body surface. Shock is invariably marked in very extensive

burns, and usually severe in extensive burns. In burns of moderate extent it is variable in degree and rarely dangerous. In small lesions it is exceptional.

Shock of moderate or mild degrees can be easily combated by treatment based upon the principles mentioned before. A severe degree of shock is a very dangerous condition. Unless great care is taken, shock can easily be aggravated by ill-chosen procedures in local treatment, and if it has persisted for any time, it resists all known methods of therapy. Cases with very severe shock may die within a few hours of injury. Others make a partial recovery, but succumb ultimately after a period of circulatory depression lasting for 24 to 72 hours.

Stage 2: Stage of acute toxæmia.—The clinical features of this stage were at one time familiar to all with experience of burns. In cases with slight or no shock there was an interval of from 12 to 24 hours in which the general condition seemed entirely satisfactory. With the onset of toxæmia the temperature rose, the pulse and respiration rate increased, the colour became dusky or livid, a state of anxiety and restlessness or of apathy appeared, and vomiting was frequent. In its fulminating form, which was common in children, acute toxæmia was rapidly fatal.

Much evidence is available to support the view that 'secondary wound shock' and also the acute toxæmia of burns are the result of absorption of a toxin or toxins into the circulation from the injured area. Recently, criticism has been directed at this view. The constitutional disturbances of burns have been attributed to concentration of the blood, and the fall in blood-pressure mainly or wholly to plasma loss. The evidence in support of the newer views is not yet so complete as to call for desertion of the older conception.

Fortunately, the principles of treatment can be stated with certitude. Coagulation of the injured surface by tannic acid prevents or minimizes the symptoms of acute toxæmia, whether by fixation of toxins or prevention of fluid loss. Those who are content with administration of fluids, on the principle of 'neutralizing the toxins', and who omit coagulation treatment, fail to use the most powerful weapon at their command. The importance of administering fluids should not, however, be forgotten. A common recommendation is to exhibit large quantities of alkali. The reason is not clear. There is no satisfactory evidence that any constant disturbance of the acid-base equilibrium occurs in acute toxæmia, and proof of beneficial action of alkalis is also lacking.

Our experience has shown that early coagulation of the injured surface modifies profoundly the clinical course. Acute toxæmia never occurs in a fulminating form, and is almost always absent in burns of small or moderate extent. In cases coming under treatment during the toxic stage the unfavourable signs usually disappear rapidly after coagulation has been secured. Acute toxæmia, even possibly of mild degree, may well, however, determine the issue adversely after severe shock in extensive or very extensive lesions.

Stage 3: Stage of septic toxæmia.—The clinical features, pathology and principles of treatment are those of an infected wound.

The results of treatment by coagulation in regard to sepsis are of much practical importance. Formerly, a mild degree of sepsis was common in the tannic-acid method and constituted one of its main disadvantages. Such is no longer the case. In superficial lesions, as, for example, after scalding, sepsis can be almost entirely eliminated by a technique to be described later. In deep burns, however treated, sepsis is inevitable. On that account some authorities recommend treatment of deep lesions by frequent immersion in baths from the commencement. It may be noted that acute toxæmia is often not prominent in deep lesions, no doubt because the skin is completely destroyed and the less vascular deeper tissues have a much smaller area for absorption. Moreover, coagulation affects only a thin surface layer and absorption of toxins cannot thereby be prevented. Treatment by primary coagulation is, nevertheless,

preferable. It permits of the more effective treatment of shock, promotes comfort, and allows a period of several days' rest before the battle against sepsis begins. Moreover, the sepsis which occurs in a deep burn so treated is usually associated with constitutional symptoms of surprisingly mild degree.

When sepsis is manifest in the coagulation method, the tanned layers must be removed and treatment as for an infected wound be instituted.

Stage 4: Stage of healing.—Questions arise at this stage relating to general and plastic surgery of a scope too extensive for this article.

General conclusions in regard to present-day treatment of burns

The basis of the modern treatment of burns is coagulation of the injured surface by tannic acid. This method has important local and general effects. (a) *Local effects:* It is rapidly analgesic. Pain, discomfort and frequent dressings are avoided while the coagulum is present. In superficial burns sepsis is absent and healing is rapid. (b) *General effects:* It lessens fluid loss from the body at the burned area. It probably helps by its analgesic effect to combat shock. It prevents or minimizes acute toxæmia, thus affecting the clinical course, mortality and prognosis based on the extent to body surface involved.

Mortality.—Our claim for a reduction in mortality by the employment of tannic acid can be fully substantiated. The evidence is statistical and only a few details are given here. The incidence of burns and scalds treated at the Royal Hospital for Sick Children, Edinburgh, remained fairly steady from 1899 to 1920, since when it has increased steadily. There was no marked decrease in mortality for five-yearly periods from 1899 up to 1923 comparable to the fall quoted by Donald. The mean mortality throughout the period was 35.4 per cent. The mortality for the period 1924 to 1930 was 8.9 per cent. The mortality during the six years immediately preceding the use of tannic acid (1920–25) was 22.4 per cent., that during the first five years in which tannic acid was used (1926–30) was 8.7 per cent. The mortality in 1930 was 5.8 and, in 1931, 4.8 per cent. (62 cases).

Prognosis.—The prognosis in burns was frequently judged from the extent of surface involvement. By common consent, involvement in children of one-eighth of the body surface was deemed almost certain to prove fatal. A revision of these ideas is necessary since the use of tannic acid. A burn involving up to one-third of the body surface in children now causes anxiety only in exceptional circumstances. In extensive burns of from one-third to one-half of the surface the condition is usually serious owing to severe initial shock, and in still more extensive lesions recovery is improbable.

Fatalities.—The fatal cases of burns can be grouped as follows:—(a) those who die rapidly from initial shock; (b) those who make only a partial recovery from initial shock and who die during the toxic stage after a period of continued circulatory depression; (c) those who die of sepsis. As a rule, their strength has been exhausted in the previous stages; and (d) those who die from complications or from causes unconnected with the injury. Groups (a) and (b) are altogether the most important. In short, it might almost be said that, at the present time, to prevent death from burns we require only the effective treatment of initial shock.

Method of treatment

The treatment of burns will be described first as regards the management of cases admitted to a hospital or nursing home, where the necessary appliances and skilled nursing are available, and, secondly, as regards treatment in the patient's own home. It is probably unnecessary to emphasize that, if hospital or similar accommodation is available, treatment should be carried out there in the great majority of cases.

Description of treatment at the patient's own home is given for the guidance of the practitioner who cannot call on alternative accommodation, or who undertakes

the care of a small superficial burn in favourable conditions.

Management of cases in hospital.—In the case of a burn of small or moderate extent and without notable degree of shock, the patient is put to bed, and the bed-clothes are supported by a 'cage', which contains electric lamp bulbs or other means of supplying artificial heat, and the area exposed to the air. If pain is severe, morphine or heroin is given.

Cleansing.—The area is cleansed under general anaesthesia. The anaesthetic of choice is nitrous oxide and oxygen, but ether can usually be given with safety. Cleansing is done by first removing all epithelium which is loose or raised by blistering. Special care is necessary to remove any epithelium at the edges, which is partially separated. The raw surface is gently swabbed, first with ether or alcohol, and then with a 1 in 1,000 corrosive sublimate solution. Vigorous rubbing or scrubbing is unnecessary and harmful.

The coagulating solution is then sprayed over the raw surface from an atomizer of any form and dried immediately by a current of hot air from an electric drier or simply by heat from the bulbs in the cage. Spraying and drying are carried out at intervals of one hour, or less if desired. Seven to ten applications are sufficient in the great majority of cases; rarely more than twelve are necessary. An alternative method to spraying is to cover the area with gauze and to soak this with the solution at frequent intervals, keeping it moist until a coagulum forms. The gauze is then removed. After the coagulum is formed, the parts are kept exposed to the air. In burns of the face and head it is necessary to protect the eyes, nostrils, and auditory meatus with moist wool during the spraying, which is the most suitable method for such lesions.

Coagulating solution.—We have experimented with various methods of inducing coagulation. The following solution is found to be the most satisfactory; it practically eliminates the mild degrees of sepsis previously found in scattered areas and seems also to hasten coagulation. It is an aqueous solution of 2.5 per cent. tannic acid and 1 in 1,000 acriflavine. Packets of powder are kept containing 7.5 grams of tannic acid and 0.3 gram of acriflavine. A convenient amount of solution is made by dissolving such a packet of powder in 300 c.cm. of warm sterile water. The solution should be made freshly for each case or occasion—not necessarily for each application.

Subsequent care.—No special local treatment is necessary after the coagulum has formed. The area is exposed to the air and can be protected from trauma and soiling by ordinary care. Burns of the perineum are treated with the patient in the prone position or lying on a frame, such as Whitman's with a space in the supporting canvas opposite the affected part. In uncomplicated cases the coagulum is allowed to separate itself. Frequently healing has become complete by the time it can readily be peeled off. Any raw areas left may be covered with a bland ointment dressing.

Sepsis.—In deep burns the same primary treatment is followed. Towards the end of the second week signs of sepsis under the coagulated layer develop and are most manifest at the edges. It is necessary then to remove the coagulum. Different methods are advised for carrying this out. On the whole, we prefer to do so mechanically by cutting it away with scissors. It is occasionally convenient to remove coagulum together with sloughs under general anaesthesia. Treatment of the area as an infected wound is then begun, by fomentations, antiseptic dressings, and baths.

General treatment.—The supply of fluids is of great moment, especially when treatment is begun during the toxic stage. In the severest cases administration of normal saline by intravenous and subcutaneous routes may be necessary, as well as copious quantities of fluid by mouth and rectum. The necessity for frequent estimation of temperature in infants and young children is not sufficiently realized. It is by no means uncommon in them for the temperature to rise suddenly about the beginning of the toxic stage. Continued application of

heat will then cause severe distress, and even possibly lead to a fatality. On artificial cooling the distress rapidly disappears. In infants estimations of rectal temperature should be made every 30 to 60 minutes, and the body temperature regulated accordingly.

Treatment of shock in extensive burns.—Treatment of this condition requires special mention. In shock the first indications are artificial heat, morphia, which seems to have a beneficial action, and fluids. The effect of this treatment is closely observed. If after an hour the systolic pressure remains below the critical level of 80 mm. Hg., or if the pressure, originally above the critical level, fails to rise, blood transfusion or intravenous infusion of gum saline is required. A failure to respond to the last measure is ominous. A very low pressure or a falling pressure may call for intravenous therapy without delay.

Local treatment.—This should be as early as may be feasible, since coagulation helps to combat shock by lessening fluid loss and pain. Local treatment, however, involves factors which may aggravate shock, e.g., general anaesthesia, and, even with the exercise of care, exposure and mild trauma. While the systolic pressure remains below 80 mm. Hg., local treatment should not be instituted, and preferably is delayed until the pressure is above 90 mm. Hg.

Anaesthesia.—Nitrous oxide and oxygen should be used. The anaesthesia need not be deep and cyanosis must be rigidly avoided. A ratio of nitrous oxide to oxygen of 3 to 1 is the highest permissible. Anaesthesia is terminated by giving a mixture of CO₂ and oxygen, or of CO₂ and air, if the necessary apparatus is available. Undue exposure and unnecessary trauma in cleansing are especially deleterious.

The treatment described above is suitable for all types of thermal injuries and also for electrical burns.

Treatment at the patient's home.—The practitioner in favourable circumstances, with the help of a nurse trained in the method, may be able to follow fairly closely the method detailed before for the treatment of small or moderate burns. Otherwise the following plan can be adopted. The area is cleansed in the usual way under anaesthesia. Gauze soaked in the coagulating solution is applied to the raw surface and covered with wool and a bandage. The dressing may be left for 24 hours or renewed at 12 hours. A coagulum forms which can then be dried by exposure to the air for a short time. After the coagulum has formed, it may be exposed to the air continuously if means for its protection are available. Otherwise it should be covered by a dressing of dry gauze and a bandage. Subsequent treatment is as detailed before.

Successful treatment by tannic acid demands interest, care and attention from those who employ it. They will be well repaid by the results.

The Doctor Under the Soviet

By HUNTLY CARTER

(Abstracted from the *Medical Press*, June 1st, 1932, p. 447)

IN Russia to-day industrial workers come first. Professionals are graded according to their public utility value. Those in the region of pure speculation have little else than speculation to live on. Since the Revolution the medical profession has always been comparatively badly off. During my last visit to Russia I stayed at a kind of hostel at Leningrad. It was used by the most eminent Russian scientists, medical and other, who came to Leningrad to undertake lecture courses. They brought their food and blankets with them. We slept eight or nine in a bare room that formed a bedroom, larder, and odd-job room. Food was stored all over the place—in between the double windows that overlooked the gloomy river, under the beds, in bags, and so on. We did our own repairs, cleaned our boots, made our own beds. The hostel provided only hot water for tea. The rooms were unheated, and in the winter we starved

and froze. It was a strange experience to watch these men of parts—engineers, geologists, anthropologists, medical men, and others—doing domestic work, or sprawling about on the little camp beds gloomily discussing their ways and means. Of money they seemed to have none at all. They were very eager to know what England was doing. Whether it was opening an avenue by which men of their distinction could escape so much misery. I was in fact kept busy with their questions. But all I could tell them was that England had its own troubles to attend to.

At an earlier date, during the black famine, that is about 1921-2, I was a guest at a big eye hospital at Leningrad, where I had an excellent opportunity of studying the effect of the terrible state of living and other conditions on the eyes of the population. The head medical officer was a German, a very amiable man, but suffering from the common complaint of little or no pay. He confided to me that he should be very glad to put me up for nothing, but he had a wife and family in Germany largely dependent on him for support. Therefore he was obliged to charge me 30s. a week for the use of a patient's bedroom, and two helpings of sausage meat a week. The rest of my diet seemed to consist of black bread and coloured water that smelt like glue. This, I was assured, was the ration that everyone in the hospital received—doctors, assistants, patients, etc.—and we were to consider ourselves lucky to get such luxury in a land where the peasants were eating each other. As for drugs and medical appliances, those that were used appeared to have come out of the Ark.

The work of a medical man in Russia is socialised in the following manner. Usually the doctor's working hours are six and a half hours a day. Those with less hours are doctors working in hospitals, polyclinics, dispensaries, and children's consultative centres—five and a half hours. Doctors employed in anatomical institutes, in radium and Röntgen-ray institutes, and laboratories, four hours. Doctors employed in institutions are entitled to two weeks annual holiday. Certain classes of specialists, such as those concerned with infectious diseases, Röntgenology, radiology, and psychiatry, are allowed from one month to six weeks holiday with full pay. Doctors working far off receive three months holiday after three years; the annual fortnight's holiday inclusive.

Doctors' salaries differ: those in villages, prisons, and concerned with psychiatry and sanitation are entitled to a rise of 20 per cent. after each two years of service. In far-off districts doctors receive a rise of 10 per cent. annually. Those employed in villages and workers' settlements have free rent, fuel, and lighting. After twenty-five years of continuous employment in such places a doctor is entitled to a pension amounting to half his pay. Social insurance for doctors is on the same basis as that of the industrial workers and peasants. Private practice is not altogether forbidden. (But, of course, it cannot be very lucrative in a country where people have no money).

The Soviet Government have passed a number of other measures for the improvement of the material and legal status of doctors working in various departments of their profession (these are not stated). The medical attitude to patients has undergone a change. Disease is studied in connection with the living conditions of the patient and the work he is engaged on. This enables prophylactic measures to be carried out more scientifically. Rapid training of medical 'workers' has become necessary owing to the industrialisation 'push', and the rapid development of collective farming. In consequence, changes are taking place in the system of teaching in universities and medical faculties, where at present greater attention is being paid to practical work in hospitals. Large groups of doctors in these institutions are occupied with the work of teaching students, and thus medical education and medical qualifications are, it is said, attaining a higher level. Thus we see the medical man absorbed by the State. It should perhaps be added that just as the Great War

led to important medical discovery, invention and development, especially in the field of surgery, so the Revolution and after events have influenced medical research work. Some day, when the true story—of which I hope to write one or two illuminating chapters—of the Russian doctor, specialist, and practitioner is told, it will be found to be a story of self-sacrifice, of heroism, of devotion to duty, and the development of medical science under appalling conditions without parallel in latter-day civilized life.

Acute Stovarsol Dermatitis

By HENRY C. SEMON, M.D. (Oxf.), M.R.C.P. (Lond.)

(Abstracted from the *Lancet*, August 13th, 1932, Vol. CCXXIII, p. 340)

STOVARSOL, which is synonymous with Spirocid (German) and Acetarsone (American), is a French product. Its value as an intestinal antiseptic in cases of amoebiasis was first reported by Manchoux in 1924, and for this purpose mainly it has come into general use both in this country and in the tropics. Its relative toxicity as compared with the trivalent (N.A.B.) series is great, and this is not surprising for according to E. Kromayer a single 4-grain tablet (0.25 g.) contains more arsenic than an ampoule of 0.2 g. Neo-salvarsan. The actual arsenical content is 27 per cent.

In an exhaustive study of six cases of stovarsol toxæmia, W. L. Bender reported malaise, jaundice, diarrhoea, coryza, albuminuria, bronchitis, and various skin rashes associated with pruritus, as among the outstanding manifestations of intolerance. While the amount of the drug administered in a given time appears to have played some part in the production of untoward effects in most of the reported cases, there are undoubtedly instances of extreme susceptibility, for one of Bender's patients developed a rash and diarrhoea only three hours after swallowing the first tablet of the course that had been prescribed. Another person was sensitive in a lesser degree not only to stovarsol but also to members of the trivalent arsenobenzene group. He concludes that on the whole the smaller the dose the fewer the reactions, and in the series reported in his paper the average total dosage was 4.6 g. (grs. 73), and the average onset of symptoms of intolerance seven days after commencing treatment.

The subject of this communication is a lady aged 32, who has been suffering for over two years from sigmoiditis and who after some general treatment in a nursing home, where intractable constipation appears to have been an outstanding symptom, was given seven 4-grain tablets of stovarsol in seven successive days (July 1st to 7th).

On July 10th she was given another tablet, and again on the 12th and 14th. She had therefore had grs. 40 of the drug when first seen by me on the evening of the 14th. On the 9th inst. she had felt ill, and on the morning of the next day she presented a rash which the practitioner in charge had regarded as a typical example of German measles, the more so as she had been in contact with an established case of the disease ten days previously. (The usually accepted incubation period is 17 to 18 days). On the following day, July 11th, the rash subsided, but reappeared again with burning and tingling of the extremities and marked stiffness of the fingers on the following day. It had again faded on the 13th during the morning, but came out more fiercely than before, with swelling of the hands and feet, oedema of the lids and lips, and conjunctivitis on July 14th when I was first consulted. Her temperature from the outset was never above 101°F., and mostly between 99° and 100°F., while the pulse varied between 80 and 116. In addition to the above symptoms I noted that the rash was a diffuse generalised scarlatiniform erythema, of punctate type, with occasional petechiae on the fingers, and most marked on the feet, thighs, and buttocks. The subjective symptoms of itching and burning were extremely severe and entirely

prevented sleep. Soporifics had had no effect since the onset of the illness. Although the cervical glands had been found enlarged when the rash was first noticed (common both to German measles and stovarsol poisoning), I could not confirm this symptom, and although nausea was complained of from time to time, neither vomiting nor diarrhoea had occurred—on the contrary, the patient remained obstinately constipated.

The outstanding features of the case were therefore (1) a generalised scarlatiniform rash, bright red in colour, aggregated particularly round the follicles, and most marked on the buttocks and legs; (2) oedema of the eyelids and to a lesser degree of the hands and feet; (3) slight conjunctivitis; and (4) subjective sensations of burning, tingling, and itching most marked on the extremities. To those must be added (5) mild shivering attacks, which had been observed by the nurse on July 9th and 12th and were present when I first examined her on the 14th. A reference to the symptomatology noted in Bender's six cases reveals a striking general resemblance with the case here reported, and in view of the relatively small amount of stovarsol administered—grs. 40 in 13 days—suggests an inherent susceptibility to the drug, which of course precludes any further administration, either of it or the closely allied compounds in the trivalent arsenobenzene group.

TREATMENT

The effects of the treatment adopted in this case were so striking that a special note seems indicated.

For some time past I have been giving 10 c.cm. intravenous injections of a 10 per cent. solution of strontium bromide (Ekzebrol) in cases of generalised irritable dermatoses—e.g., urticaria—in which a labile or hyper-sensitive condition of the sympathetic nervous system could be postulated. Within a few minutes of injecting it in this case, the tendency to rigors had disappeared (the solution produces a subjective feeling of heat all over the body for a short time), and shortly thereafter the patient declared herself free of the pruritus and pricking sensations; she slept for four hours that night, for the first time since the onset of the illness.

The following morning the nurse reported that the rash had faded somewhat, and that there was only slight irritation at times. The hands and feet were still swollen but not painful. A second injection of Ekzebrol was given in the evening and the patient slept for 7½ hours. The rash was obviously fading on the next day and no injection was given, as there was no irritation. The patient complained of throbbing and swimming of the head on movement with ringing in the ears, and on the following day (July 17th) 10 per cent. calcium chloride (Afenil) was substituted for the strontium compound, and 10 c.cm. of it were given intravenously. Nine hours sleep followed and on the following day convalescence had set in. There was no rash and no irritation, although the skin of the extremities was noted to be slightly peeling.

It is not claimed that recovery was notably hastened by the treatment, although a comparison with the duration of symptoms in Bender's cases suggests it. It is on the subjective side that it appears to have been so valuable, and therefore worthy of a more extended trial in future cases of intolerance and poisoning by the drug.

Reviews

INTERNATIONAL CLINICS. Volume III. Forty-first Series. September, 1931.—Edited by H. W. Cattell, A.M., M.D. London: J. B. Lippincott Company, 1931. Pp. viii plus 326. Illustrated. Price, 12s. 6d. [Obtainable from Butterworth and Co. (India), Ltd., Calcutta]. Price, Rs. 9-6 per volume.

International Clinics is a quarterly of illustrated clinical lectures and specially prepared original articles

on topics all of interest to students and practitioners by leading members of the medical profession throughout the world. This volume begins with the clinical presentation of cases at the Harvard medical society. It is of great interest to note the comments on the insulin-fattening cure in diseases other than diabetes mellitus. The opinion expressed is that the insulin therapy is very well tolerated and the results gratifying in all conditions of emaciation. The next chapter is on blood and heart diseases. This volume is full of useful information. The discussions on the various topics are of great interest as they deal with the most up-to-date progress in medical science.

S. P. B.

INTERNATIONAL CLINICS.—Edited by H. W. Cattell, A.M., M.D. Volume I, Forty-second Series, 1932. London: J. B. Lippincott Company, 1932. Pp. viii plus 307. Illustrated. Price, £2 10s. for the set of four volumes. 12s. 6d. per volume. [Obtainable from Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 37-8 per set. Rs. 9-6 per volume].

THE first volume of the forty-second series of *International Clinics* contains several interesting and important articles.

Hyperinsulinism and dysinsulinism are now recognised clinical entities and a very able description of these uncommon conditions is found in the first chapter of the book.

Of the articles that may be considered to be of more interest to the general practitioner, those on pelvic pain in women, the modern treatment of digestive disease and the acute surgical abdomen are mentioned.

A review of recent progress in medicine, recent advances in treatment, and paediatric progress form the subject-matter of the concluding chapters.

The latest volume of this well-known quarterly continues the high standard that has been set by its predecessors.

H. H.

PULMONARY TUBERCULOSIS. Volumes I and II.—By M. Fishberg, M.D. Fourth Edition. London: Henry Kimpton, 1932. Vol. I:—Pp. 567, illustrated with 138 engravings and 8 plates. Vol. II:—Pp. 624, illustrated with 94 engravings. Price, 70s. (In two volumes).

DR. FISHBERG's work in two volumes on pulmonary tuberculosis has now reached a fourth edition. This is ample indication of the value of the book and it may be stated at once that the new edition will be welcomed by a large circle of readers.

All the advances in our knowledge of the disease during the last few years have been depicted, and the great importance of early diagnosis and roentgenography has been stressed.

The days have passed in which marked physical signs in the chest were necessary to make a definite diagnosis, for these signs and even the presence of bacilli in the sputum are now considered to be comparatively late signs of tuberculosis of the lungs.

We know now that the great majority of persons are, at some time or other, infected with tuberculosis. Indeed Dr. Fishberg states that the only dispute on this matter is whether the percentage is only 70 or reaches 100.

Knowledge of this kind immediately invokes the question, why then are so few permanently incapacitated while so many recover without any symptoms of disease?

The opening chapters on modes of infection, predisposition, heredity, the occupational factor and

many other important aspects of the disease help to some extent in finding an answer to this important question; but it must be confessed that there still remains a gap in our knowledge which has yet to be filled. The chapters on pathological anatomy and the morphogenesis of tuberculosis have been entirely revised. The doctrines of Ranke, which are now accepted by the majority, are explained and discussed. Symptomatology including roentgenography is described at length and it is pleasing to find that the importance of accurate clinical examination is stressed, while the correct methods of palpation, percussion and auscultation are very clearly told and accurately illustrated.

The greater part of the second volume deals with the management of the tuberculosis patient and the treatment of his symptoms.

The advantages and disadvantages of the many institutional methods are discussed, and it is clear that Dr. Fishberg considers the social and economic factors in each case to be almost as important as the pathological condition in devising a line of treatment.

Drug therapy is useful only for the relief of symptoms, and tuberculin in the opinion of the author is of little if any value.

Therapeutic pneumothorax receives the share of notice that it undoubtedly deserves, but the author has restrained his enthusiasm, for it is but a very small percentage of cases that are suitable for this surgical procedure.

The volumes are extremely well produced and illustrated. A noticeable feature is the style of writing and arrangement. The reviewer has seldom found a work of this kind easier or more pleasant to read.

There can be but very few books on pulmonary tuberculosis more important than this one. It should be in the possession of all who specialize in the subject, while every medical man will find here a great deal of value and interest.

H. H.

THE FRANCIS TREATMENT OF ASTHMA.—By A. Francis, M.B., B.Ch., B.A. (Cantab.), M.R.C.S. (Eng.). London: William Heinemann (Medical Books), Ltd., 1932. Pp. xiv plus 43. Price, 2s. 6d.

THIS work is mainly concerned with the value of nasal cauterisation for the treatment of asthma. Dr. Francis' results are based on 1,066 cases; out of these 51.5 per cent. were completely relieved, with great improvement in another 34.8 per cent., making a total of 86.4 per cent. The author considers that there is an area on the nasal septum opposite the outer end of the middle turbinate bone, which is the site of election for cauterisation. There are supposed to be certain spots in the mucosa which when destroyed inhibit the reflex bronchial spasm. We are not told how to find these spots or the depth of the cauterisation necessary. He considers that with a good or moderately low blood pressure and a normal nose the prognosis for a cure after cauterisation is very good, that with nasal polypus the prognosis depends on whether the patient can take aspirin and if the blood pressure is high, otherwise the prognosis is very bad in cases who do not respond to aspirin and have a low blood pressure. He regards asthma as a vaso-motor type of neurosis combined with McDonagh's idea of augmented hydration.

The bulk of the volume consists of a record of 402 cases given briefly. Dr. Francis apparently regards asthma as a disease and not as a syndrome, and looks at it purely from the point of view of a rhinologist. We have not tried his method of treatment but have been as successful in our results by finding out and eradicating the cause of the bronchial spasm and turgescence of the mucous membrane.

H. W. A.

ALLERGY.—By G. H. Oriel, M.A., M.D. (Cantab.). London: John Bale, Sons and Danielsson, Ltd., 1932. Pp. ix plus 78. Price, 2s. 6d.

THIS pocket monograph on allergy by Dr. G. H. Oriel, a well-known authority on the subject, gives a very clear, concise and simple explanation of the phenomenon which is dealt with in 74 pages. Like all monographs it is really meant for students who are trying to obtain the ground work of their subject.

The different allergic conditions in man, such as hay fever, asthma, skin allergies, are dealt with briefly. Migraine is considered to be an allergy of the central nervous system, while epilepsy is mentioned as a possibility, but this is not discussed. The different arthritic conditions such as osteo-arthritis, intermittent hydrarthrosis and the joint lesions seen in serum-sickness are briefly discussed in five pages. There is a useful appendix at the end of the book wherein is described the treatment of the acute attack by adrenalin and ephedrine, and various types of empirical treatment such as peptones or auto-hæmotherapy, tuberculin and others. There is a short account of the protein test which should be very useful to the practitioner.

H. W. A.

CRYSTALLIZED THERAPY.—By M. V. Parulkar, M.B., B.S. Second Edition. Bombay: D. A. Nadkarni and Co., 1932. Pp. v plus 823. Price not stated.

THE volume consists of a series of prescriptions and instructions for the management of the diseases in a compact form. In the treatment of certain diseases the village doctors might be misled on following the directions given by the author. One does not follow Dr. Parulkar when he says in the prophylaxis of malaria 'never sleep in a room inhabited by a malarious patient and use boiled water'. Does he want to revert to the malarial toxic emanation theory? He mentions plasmoquine to be taken three times a day along with quinine. The author apparently does not know the toxic effect of this drug and how useless it is for therapeutic purposes in malignant tertian infections. In the chapter on dysentery he has made several mistakes. He recommends serum in acute dysentery, either Flexner or Shiga, and that in 20 c.cm. daily doses. He gives magnesium sulphate in 2 drachm doses, and continues it every three hours till he obtains a formed stool. He mentions some eastern drug the composition of which is not known. There are undoubtedly a few good collections of prescriptions for treatment. But for practical purposes one is against this type of book which gives only a few formulae for treatment. It takes away the liberty of the practitioner and makes him a slave. This is detrimental to the healthy growth of mind which is of the greatest importance in general practice.

S. P. B.

ESSENTIALS OF SURGERY.—By R. L. Spittel, F.R.C.S. (Eng.). Calcutta: Butterworth and Co. (India), Ltd., 1932. Pp. xi plus 585, with 107 illustrations. Price, Rs. 8 per copy.

THE purpose of this small book, which consists of 585 pages, is to inculcate the general principles of surgery, and to present in a concise form the instruction contained in the large standard textbooks. That it has succeeded in both these endeavours is perfectly correct, but we cannot agree with the author's preface that this book renders the perusal of textbooks unnecessary for students reading for examinations.

It is at present incomplete, as the surgery of the abdomen and pelvis still remains to be written.

Mr. Spittel does not like the textbooks for students as he considers them too bulky and long winded, and says that students are apt to forget one part while they are studying another, and while trying to master s-

much detail they are prone to lose sight of general principles.

No doubt there is truth in this, but it is also true that condensation is apt to provide too little detail for the student to obtain an adequate knowledge of his subject.

The book on the whole is well written, and describes briefly under the various headings most of the essential features of the different conditions it deals with.

It is, however, rather poorly got up, the illustrations are few, and consist chiefly of photographs, with a few simple drawings.

H. E. M.

THE DIABETIC A-B-C: A PRACTICAL BOOK FOR PATIENTS AND NURSES.—By R. D. Lawrence, M.A., M.D., F.R.C.P. (Lond.). Second Edition. London: H. K. Lewis and Co., Ltd., 1932. Pp. vii plus 56. Price, 3s. 6d.

THIS little book is intended to be used as a practical guide-book by patients and nurses especially to enable them to follow the author's 'line ration' scheme of dieting intelligently. In the present edition, the carbohydrate content of the 'line ration' scheme has been doubled, each black line containing 10 gms. of carbohydrates instead of 5. The other essentials in the scheme have been left unchanged.

A brief description of what diabetes is has been given in the book as well as some practical instructions as to what to do when ill. The technique of insulin injections, as also what to do in case of an overdose of insulin, are described.

We think the book will prove useful to those for whom it is intended.

J. P. B.

KHADYA-TATTVA OR THE PRINCIPLES OF DIETETICS. (Written in Bengali).—By B. B. Pal, L.M.S. First Edition. Published by Indu Bhushan Pal, Esq., 1/1, Ananda Chandra Ray Street, Dacca, 1931. Pp. 187. Illustrated. Price, Re. 1.

THIS is a book on diet in the Bengali language. The author has expressed, in elegant Bengali style, the proximate principles of diet and the necessary changes in different spans of life. It is very unfortunate that there is no mention of rice gruel in the diet list of children. This substance is regarded as a better substitute for barley water. There is also no mention of the various methods of preparation of different dietaries. However the reader is sure to find extremely useful information in the book.

S. P. B.

ADVICE TO THE EXPECTANT MOTHER: FIFTY ANTENATAL TALKS.—By G. T. Birdwood, M.A., M.D., D.P.H. London: John Bale, Sons and Danielsson, Ltd., 1932. Pp. viii plus 92. Price, 3s. 6d.

THE doctor who finds difficulty in eliminating the less essential facts and in simplifying his knowledge sufficiently for presentation to the average working-class mother will be helped by this small book. All the important advice necessary for a woman during pregnancy is contained in the fifty outline talks designed to cover the 40 weeks of pregnancy. The majority of the talks are simple and short, conveying one lesson only and there is much repetition of essential points. Doubtless Colonel Birdwood's experience as a professor of midwifery in Lucknow and as medical officer to a child welfare clinic has taught him that attention to these points is very necessary in successful teaching.

Even when the standard of intelligence is not high, the adult will respond better to suggestion accompanied by explanation than to suggestion alone and it hardly

seems enough to make bald statements such as 'Washing the body keeps the skin healthy and acting well' and 'Danger in confinement may arise from diet' without any explanation of how and why the effects are produced. The average mother and teacher would benefit if suggestions for practical illustration of points mentioned were appended to the talks on alcohol, sunlight and fresh air, etc.

Blank pages are interleaved and doctors and nurses using the book will find this very advantageous in amplifying and adapting the talks and in noting down material for illustration and demonstration which will appeal to different classes of pregnant women and make the antenatal clinic, not merely medically but educationally also, of lasting value in the community.

J. M. O.

MOTHER CRAFT: ANTENATAL AND POSTNATAL.—By R. C. Jewesbury, M.A., D.M. (Oxon.), F.R.C.P. (Lond.). London: J. & A. Churchill, 1932. Pp. ix plus 178, with 21 illustrations, 13 in colour. Price, 10s. 6d.

IN this small volume Dr. Jewesbury makes the prophetic statement that a special diploma will in the future be instituted in maternity and child welfare. The teaching of pædiatrics can receive only small attention in the overburdened curriculum of the student, and in the absence of postgraduate teaching the young practitioner on his first appointment to an infant welfare post is faced with many unsuspected problems in infant feeding and details of management, and in his inexperience he will turn gratefully to the book which Dr. Jewesbury has written from the experience of 25 years of maternal and infant welfare work.

The teaching is sound and almost all of the departures from health met with in the course of an ordinary welfare session are adequately dealt with. There are very few books written, as this presumably is, for the medical man on the subject of mother craft, hence it is likely to serve as a practical guide for the maternity and child welfare medical officer until superseded by an amplified edition.

The venereal diseases and their manifestations in mother and child are not mentioned, nor are the nutritional anæmias. More definite directions for breast massage would be a welcome addition and not every one will agree that interference with respiration is the cause of the palatal and other deformities associated with the use of a dummy, nor with the opinion that diluted milk is needed up to 17 months of age. On page 107 the figure for sugar should be 87.5 and the total 423.7.

The author is frankly an enthusiast for the Truby King system, and other milk modifications are only briefly mentioned. He justifies his enthusiasm, however, by some excellent and convincing charts.

J. M. O.

THE PRACTICE OF CONTRACEPTION.—Edited by M. Sanger, M.D., and H. M. Stone, M.D. London: Baillière, Tindall and Cox, 1931. Pp. xviii plus 316, with 22 figures in the text. Price, 21s.

'THE Practice of Contraception' is compiled from the *Proceedings of the Seventh International Birth Control Conference* held at Zurich in 1930. Papers were read describing the various methods—mechanical, occlusive, intra-uterine, chemical, etc. So many methods and devices serve to show that the ideal method has yet to be found.

It is to be regretted that there is much in the book which is vague, loose and unscientific. Many of the statistics are of the same type.

Part II is entitled 'Abortion'. It is largely devoted to descriptions of methods of interrupting pregnancy by injecting substances into the uterus. These methods

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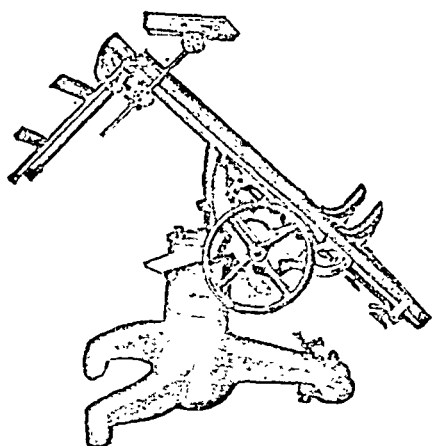
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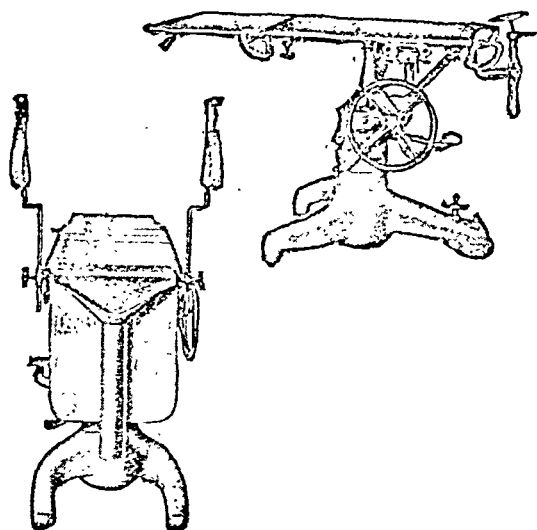
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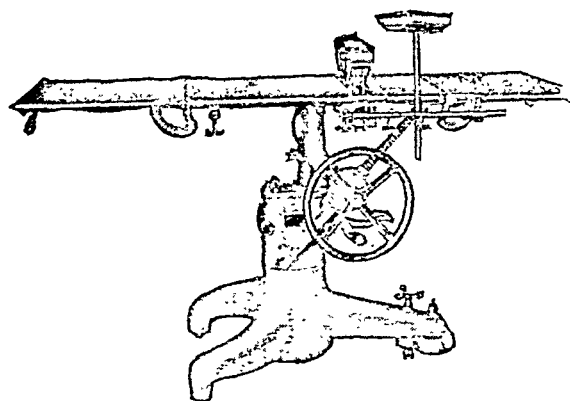
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will only commend themselves to the criminal abortionist; they are dangerous and should be condemned.

Part III is made up of reports from various countries on the progress of birth control. The Indian report—Captain Pillay's from Sholapur—is quite interesting.

S. A. McS.

THE PRINCIPLES AND PRACTICE OF PSYCHIATRY.

—By A. Cannon, M.D., Ph.D., D.P.M., and E. D. Tranchell Hayes, M.D., D.P.M. London: William Heinemann (Medical Books), Ltd., 1932. Pp. xvii plus 437, with nearly 150 illustrations. Price, 25s.

THIS is really an amazing book. It contains almost everything that a student of psychiatry could ever think of, as well as a good deal he would never think of; for example, a portion of the farewell address of one of the authors to the University and Government of Hong Kong—in rhyme! It also contains an illustrated deaf-and-dumb alphabet and many other out-of-the-way things as well. Unfortunately the book contains some mistakes—some of them serious ones, like the definition of 'psychiatry' which is stated to be 'the study of abnormal behaviour'. The authors are intensely dogmatic in their views so that hardly a point is discussed; nearly everything is stated as *being so*. Out of a total of 429 pages, only three are devoted to psychotherapy, and the section on this subject opens with this pregnant utterance: '..... there is one thing I am quite certain of, and that is that in the successful treatment of any mental or surgical disease, disorder or condition there are *unseen powers* at work. That every word has *magic power* cannot be denied. What is this magic unseen power? It is our own *personal magnetism*; what that is I dare not attempt to describe, and of its workings there is an abundance of evidence'. The arrangement of the book as a whole is so devoid of any sequence that the reader soon begins to feel he is a veritable little Jack Horner. For example, on p. 408 there is a list of what the authors call 'Psycho-analytic Symbols', fifty-seven in number. On the previous page (p. 407), we find a classification of the disorders of the pituitary gland, and on the following page (p. 409), a form of reception order. Nevertheless, in spite of these curious features, the book may be found useful as a work of reference, although it is unlikely that it will be of much value in the direction the authors anticipate and intend, namely, as a cram-book.

O. A. R. B-H.

AN INTRODUCTION TO ANALYTICAL PSYCHOTHERAPY.—By T. A. Ross, M.D., F.R.C.P.E., M.R.C.P. London: Edward Arnold and Co., 1932. Pp. vii plus 207. Price, 10s. 6d.

Dr. Ross is fundamentally a psychoanalyst but by no means an orthodox one. His experience during the late war led him to modify his earlier conviction of the rectitude of the Freudian belief in the pre-eminence of the sexual instinct in the aetiology of the neuroses. He is therefore somewhat contemptuous of the attempt of the orthodox psychoanalysts to enlarge, as a result of experience derived during and after the war, their concept of the sexual factor so that the so-called war neuroses are now held by them to be due to an injury of the patient's narcissism or self-love. In his introduction Dr. Ross discusses the still debatable question of the relation of mind to consciousness, and expresses his surprise that in face of the facts at our disposal, anyone can maintain that mental activity is identical with consciousness. Orthodox psychoanalysts will be incensed at Dr. Ross for maintaining that there is nothing fundamentally incompatible in the psychological concepts of Freud, Adler and Jung. Dr. Ross devotes chapter VIII to the record of a minute study of a single case. The discussion of the aetiology of the patient's neurosis will repay careful study. The chapter on the 'dangers' of analytic investigation contains a great deal which deserves attention. No psychiatrist can afford

to disregard any serious attempt at an estimation of the part played by religion in the causation as well as in the prophylaxis of mental disorders. Some data on the prevalence of neuroses among persons who believe in a 'father' religion, e.g., Judaism and Islam, and those who follow a 'mother' religion like Hinduism or Roman Catholicism, would be very interesting. Dr. Ross maintains that no person for whom religion is a success suffers from neurosis, not at any rate from one for which he consults a doctor. On the other hand, Dr. Ross appears to overlook the psychopathological significance of a sudden religious 'conversion'. Protestants who become Catholics may, and frequently do, rationalise their 'conversion' as the outcome of a preference for the 'logicality' of Catholicism as opposed to the 'illogicality' of Protestantism, but persons do not change their religion as a result of 'logic'. Dr. Ross discusses with considerable penetration the question of analysis causing 'insanity'. He concludes his discussion with the advice to his colleagues to take a leaf out of the book of the surgeons, who while they rightly indicate that it is sometimes the disease and not the operation which has killed the patient, are also willing to admit an operation mortality which has nothing to do with the disease. The author must be congratulated on the final paragraph of his book for herein he emphasises the intimate relation between the 'mental' and 'physical' aspect of all diseases. He expresses a hope that his book will be read by those who in their preoccupation with 'physical' disease, omit to observe its mental repercussions. Those who agree with Dr. Ross on this point will doubtless rejoice if this hope is gratified.

O. A. R. B-H.

RECENT ADVANCES IN ANÆSTHESIA AND ANALGESIA.—By C. Langton Hewer, M.B., B.S. (Lond.). London: J. & A. Churchill, 1932. Pp. viii plus 187, with 64 illustrations. Price, 21s. 6d.

THE 'Recent Advances' series has produced many excellent treatises and the volume under review is no exception. Surgery has made rapid progress during recent years and along with it anaesthetics and analgesics have kept pace. Anaesthesia, like many other branches of medicine, is tending to become more and more specialised and an anaesthetist of modern days, to be of real help to the operating surgeon, should keep himself thoroughly up to date and well informed of the recent developments in the subject. This book, written by the anaesthetist to one of the largest and best-known hospitals in England, puts before the reader all the recent work on anaesthetics and analgesics in a clear and concise form omitting all unnecessary details. The author has not only given an account of the important drugs introduced in this connection, but a description of the latest contrivances for administration of anaesthetics have been given with illustrations. The chapters on spinal anaesthesia, anaesthesia for nasal, throat and oral surgery and the sequelae following the administration of various types of anaesthetics have been described in detail. The book is thoroughly practical and will interest, not only the anaesthetist, but medical students and practitioners.

R. N. C.

RECENT ADVANCES IN PATHOLOGY.—By G. Hadfield, M.D., F.R.C.P. (Lond.), and L. P. Garrod, M.A., M.B., B.Ch. (Camb.), M.R.C.P. (Lond.). London: J. & A. Churchill, 1932. Pp. x plus 392, with 67 illustrations. Price, 15s.

THIS small book is one of the 'Recent Advances' series on most branches of medicine and surgery, that have been produced by this well-known firm of medical and scientific publishers, during the past year or two.

Owing to its nature the book is of necessity one of special pathology, in that each system or morbid condition is dealt with separately. It is divided into fifteen chapters and with the exception of malignant growths which occupy three chapters, kidney diseases and cardiovascular diseases, each of which have two chapters

devoted to them, one chapter contains a symposium of the recent work on a single disease or organ. The chapters in which condensation has not been necessary are remarkably clearly written and easy to read, notably the chapter on respiratory diseases, but in the sections where considerable advances have been made and a large amount of information has to be crowded into a small space, as in the case of kidney diseases, the book is much more difficult to follow.

The word 'recent' appears to have been somewhat liberally interpreted, for one finds frequent references to work over twenty-five years old. No doubt these older references give a certain background and perspective, but had they been curtailed, more space would have been available for accounts of really recent work. The chapter on the ductless glands is somewhat disappointing as only the thyroid, parathyroids and adrenals are included. The pituitary and sex glands have not been mentioned.

On the whole the book appeals to the reviewer most as a volume for a rapid revision of the subject prior to an examination, but as each section in each chapter is followed by a list of useful references it will also be of use to the more advanced worker. Mistakes in printing are few, only three small ones being noted, and as is usual with books from this house of publishers the printing, binding and general get up are excellent.

P. A. M.

QUANTITATIVE CLINICAL CHEMISTRY. Volume II. Methods—By John P. Peters, M.D., M.A., and D. D. van Slyke, Ph.D., Sc.D. London: Baillière, Tindall and Cox, 1932. Pp. xix plus 957, with 95 figures in the text. Price, 52s. 6d. (Price of the two volumes ordered together is £5 5s.).

THE first part of this highly important and instructive treatise, dealing mainly with 'Interpretations' was reviewed by us about a year ago. Following the plans outlined there, the authors have, in the present volume, described methods for the determination of those substances which are found in the body and its excreta, and which are of importance in clinical medicine.

The value of the book has been much enhanced by the practice which the authors have consistently followed in prefacing each chapter with a discussion of the principles on which the 'methods' are based. The reader will thus get an opportunity of not only securing a critical view of the 'methods' that have been included and described in the book but it will guide him to other methods described in the literature. This will be a great help to people doing research and original work.

The book contains 32 chapters and a very useful appendix which deals mainly with methods for renal and hepatic function, the semi-quantitative estimation of bile pigments in the blood-plasma, and methods for estimation of chlorides in the gastric contents.

Each chapter begins with a discussion of the principles of the 'method', and then follows a description of the different methods of analysis including gravimetric, titrimetric, colorimetric and gasometric, which gives the reader ample opportunities to choose the procedure best suited to him according to the laboratory facilities available to him. As in volume I, a generous bibliography given at the end of each chapter is of special interest in the book and will, in our opinion, prove to be of invaluable assistance to those who desire to pursue further work on the subject.

We feel quite sure that the present volume will prove to be a standard work of reference and those engaged in the study and practice of quantitative clinical chemistry would do well to have both volumes for their guidance and reference.

J. P. B.

PHARMACOPŒIA INDICA—By K. C. Bose, M.B. Published by The Book Company, Ltd., Calcutta, 1932. Pp. 371. Illustrated. Price not stated.

ALL civilised and progressive countries have their own pharmacopœias. India has none in spite of the fact

that a large number of indigenous drugs, not included in the British Pharmacopœia, are regularly used in this country by the medical profession. Dr. K. C. Bose, therefore, deserves to be congratulated in making a beginning with his 'Pharmacopœia Indica' which contains information on a collection of vegetable, mineral and animal drugs in common use in India.

This book is an enlarged edition of the 'Official Indigenous Drugs of India' published by the author in 1902. Though a good deal of material has been incorporated in the body of the volume and an appendix on the methods of drug analysis and pharmacological experimentation is given at the end, no substantial alteration in the subject-matter is seen and the book is not up to date so far as recent work on the indigenous drugs is concerned. Too much regard appears to have been shown to the findings of early European physicians who published their observations nearly fifty years ago and their opinions have been quoted in various sections of the book. While not denying the utility and accuracy of these clinical observations, we should not ignore the fact that these findings were recorded at a period when the opportunities and facilities for critical evaluation of the properties of various indigenous remedies were non-existent. Some of these statements, therefore, were bound to be dogmatic and are difficult to support on scientific and rational grounds. The author has given his personal views in many instances and these are well worth perusal. He has not allowed himself to be carried away by sentiment with regard to these remedies as is so often the case and the statements made by him are considered and moderate. The book will greatly interest those interested in Indian indigenous drugs.

R. N. C.

Annual Reports

REPORT OF THE CHEMICAL EXAMINER TO THE GOVERNMENT OF THE PUNJAB FOR 1931. LAHORE: SUPERINTENDENT, GOVERNMENT PRINTING, PUNJAB. 1932. PRICE, AS. 10.

THIS annual report—by Major D. R. Thomas—is always of considerable interest, and the report for 1931 contains much useful information.

The total number of cases investigated during the year was 2,872, comprising 10,358 articles. There was a marked increase in the number of excise cases sent by deputy commissioners. Out of the 1,001 stain cases, 574 were cases of murder or hurt by violence, 298 were cases of rape, and 128 of unnatural offences. In 9 cases specimens of human hair or bones were sent in for identification. Poison was detected in 66 per cent. of human poisoning cases and in 48 per cent. of cases of cattle poisoning.

In 201 human poisoning cases no indication of the poison suspected was given, and in 23 cases the indication given was misleading—i.e., a poison was found other than that suspected. In 5 cases of suspected opium poisoning the stomach had been washed out with potassium permanganate solution, which of course destroys the tests for opium. In one case of suspected alcohol poisoning the stomach was sent preserved in spirit instead of in saline! An interesting case was one in which magnesium sulphate which had been administered was found to contain oxalic acid, and the dose proved fatal.

Of the poisons employed in the human cases, opium of course heads the list—41 per cent. Then come arsenic—21 per cent.; dhatura—16 per cent.; alcohol—4 per cent.; followed by a long list of much more rarely employed poisons. Poison was detected in 29 out of 65 cases of animal poisoning. Arsenic, potassium ferrocyanide and *Abrus precatorius* were the chief poisons employed.

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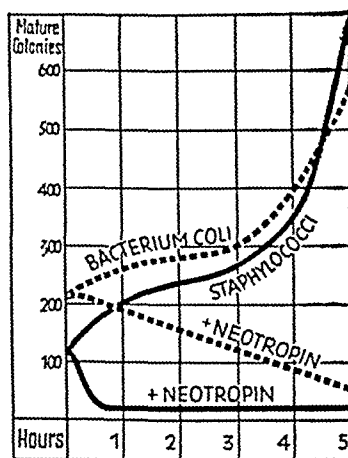
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(1) The quantitative estimation of opium and its fatal dose.

(2) The difficulty of getting a diagnosis of opium poisoning after death.

(3) The possibility of opium being given for homicidal purposes in adults.

I. Opium is obtained from the unripe capsules of the poppy. It contains many alkaloids of which morphine is the most important. Punjab opium contains from 4 to 9 per cent. of morphine. As the fatal dose for morphine is about three grains in non-addicts, that of opium is generally assumed to be about 30 grains. The opium habit is very prevalent in this province and it is not unusual for an addict to take 100 grains a day and continue with it for years. When any of these addicts die of natural causes and their viscera are submitted for analysis, opium is found, yet death is not due to opium poisoning.

Opium is the only medicine procurable in the villages and is given for all ailments and accidents to relieve pain. For these reasons alone, quantitative estimation has no medico-legal value as the fatal dose is not known in addicts.

II. Death can be certified to be due to opium poisoning from:—

(1) Symptoms observed before death.

(2) The post-mortem signs of death due to asphyxia.

(3) A positive report from the Chemical Examiner.

(4) History of addiction to the drug or otherwise.

Should a body be found (1) will be absent and (2) may not be present due to decomposition and (4) the body may not be identified. In such a case (3) is the only evidence and that report will be that opium was found. In such a case you must look upon it as opium poisoning until you can prove the contrary. You must further look upon it as suicide or accidental poisoning unless in an infant, or an alcoholic who was given opium when very inebriated.

I feel that medical officers could certify death to be due to opium poisoning with the utmost confidence if the deceased had been under treatment. Many such cases do not give the tests for opium as potassium permanganate has been administered, although the history, symptoms and signs of opium poisoning were definite. I think a little more initiative should be shown in this quarter.

III. The police officer in his last question asks if it can be taken as an incontrovertible dogma that opium is not and cannot be used against adults for homicidal purposes.

A sure way of arriving at a just conclusion on the issue raised is by reference to statistics and by a study of the symptoms of poisoning by opium and finally by consideration of the comparative merits of opium and other poisons from the would-be homicidal person's point of view:—

(a) I have looked up all the available statistics in the western countries, including the United States and also India and there are very few cases where opium has been successful as a homicidal poisoning in adults. All textbooks agree in describing opium as the favourite poison for the suicide in the East.

(b) Poisoning by opium is a comparatively pleasant means of putting a period to existence. It is also a somewhat drawn out process. Finally there is an excellent chance of the person recovering if the proper treatment is administered in time. Taking these circumstances into consideration can one come to any other conclusion than that opium is the weapon of the suicide and not of the homicide?

(c) The unpopularity of opium as a homicidal poison may be thus summarised:—

(1) The bulk required which is about 30 grains. This is the size of a small walnut. Addicts would require much more.

(2) Its bitterness, its smell and its dark brown colour; it is so well known in India that it would be recognised.

(3) The period of consciousness, the victim has ample time to give warning and get treated.

(4) The treatment is very simple and satisfactory. The stomach is washed out with a weak potassium permanganate solution followed by artificial respiration and stimulants when necessary.

(5) There are so many certain and popular homicidal poisons in India. It would be just as unnatural for an Indian to give opium to murder another as it would be for an European to give alcohol to one of his own race for the same purpose.

(6) Poison as a liquid or a powder is more popular than as a sticky solid.

The most conclusive argument for saying that opium is not used for murder is the fact that all attempts would not prove successful and those cases where recovery took place would be brought to light and a charge of attempted murder would be framed. I have neither had such a case nor have I heard or read of one.

Cremation certificates

In India the practice of swift cremation of mortal remains upon the very day of death is prevalent amongst the more orthodox Hindus from time immemorial. There is probably more cremation in India than all the rest of the world. It is certainly a very sanitary way of the disposal of the body but it has one great defect, that it leaves no means of further investigating the cause of death after the body has been cremated. Going through my old reports since the year 1924 I find that 92 cases of ashes and bones were sent for analysis under suspicious circumstances and that arsenic was detected in 10 cases and mercury in 5 cases.

The detection was therefore over 15 per cent. The poison was found in the bones that were not well burnt and possibly in some of those cases that were rescued by the police before the body was completely cremated. The detection of arsenic and mercury was contrary to expectation for such volatile poisons should be dissipated by fire and lost beyond the possibility of detection in anything reduced to ashes, but the conditions under which cremation is usually carried out evidently do not favour complete combustion, and sublimation of the volatilized arsenic and mercury in the cooler parts of the funeral pyre is liable to take place and its loss thus prevented. Deaths due to alkaloids, or the more volatile group of poisons, cannot be detected in ashes.

The Cremation Act of 1902 in England lays down that special precautions shall be taken before cremation, in order to establish beyond doubt that death was due to natural causes. A special certificate must be obtained amongst other things signed by the doctor in charge of the case. A second or confirmatory medical certificate must also be produced by a doctor especially empowered to grant such certificates.

It must be at once realised that such a procedure is impossible for India with all its far flung villages where there may not be a medical man within a hundred miles. However, I feel compelled to mention this subject after having been consulted recently by a certain police officer. This officer mentioned a case where a woman was insured for Rs. 30,000 in November and died in the following February. A qualified doctor gave a death certificate due to natural causes probably all in good faith, the body was cremated and the policy was paid. This officer had very grave suspicions as to the cause of death, yet he felt he could do nothing. This was only one of many cases that had come under his notice during his service in the police.

I am afraid I cannot offer any constructive criticism, yet there must be some way of preventing murder by poison and obliterating the only possible source of its detection. Rapid cremation is a most dangerous loophole.

Summonses to Court

Hardly a month passes without that a magistrate issues a summons to the Chemical Examiner or one of his Assistants to appear in his Court on a certain day. It may be in connection with a murder case, an excise case or something quite trivial as the identification of seals or exhibits. The summons is always returned

immediately with a polite letter saying that our absence from the laboratory would upset all our work. I wish magistrates would realise that this laboratory works at high pressure and there may be as many as 20 cases going on and this work cannot be interrupted. There may be occasions when a magistrate may require certain information, in which case I always ask them to send me their difficulties by letter and I will endeavour to let them have the information by return of post. This has always worked well. The official procedure in summoning the Chemical Examiner to Court is by first obtaining the permission of the Honourable Judges of the High Court. I would respectfully ask all magistrates to show as much consideration as possible in this matter.

Bad prescribing and dispensing

The following mixture was prescribed for an educated Indian lady by her medical adviser and the prescription was made up by a firm of chemists:—

R. Liquor Ammonium Citrate	.. 3 drachms
Potassium Bicarbonate	.. 65 grains.
Sodium Benzoate	.. 30 grains.
Vinum Ipecacuanha	.. 10 minims.
Syrup Vasaka	.. 1 drachm.
Aqua chloroform up to	.. 1 ounce.

The directions were that one such dose was to be taken thrice daily. Before criticising this prescription from the pharmacological point of view I shall tell you how the case came under my notice.

The patient took one dose and immediately complained of a burning sensation in the mouth, throat and stomach. Then she fell down senseless, barely having time to put away the tumbler. She was unconscious for about an hour. Gradually she recovered but complained of lack of vision and helplessness in all her limbs. She had burns on the lips and in her mouth and continued weak with a feeling of lassitude and numbness in her limbs for a few days. She subsequently made a complete recovery.

The mixture was sent for analysis. It was found that instead of making up the dose to one ounce with aqua chloroform, the dispenser had added neat chloroform, for about 2 drachms of pure chloroform was separated from each dose.

Pharmacological criticism

(1) The mixture shows a very poor knowledge of the therapeutic action of drugs.

(2) The liquor ammonium citrate is chemically incompatible with the potassium bicarbonate in that carbonic acid gas is set free. In India liquor ammonium citrate soon turns slightly acid, although when fresh, it is neutral in reaction. The dispenser should have realised this.

(3) The dose of potassium bicarbonate is more than twice the maximum B. P. dose.

Errors in dispensing

(1) The dispenser added pure chloroform instead of the aqua chloroform.

(2) He should have noticed that the pure chloroform did not mix with the other ingredients but sinks and forms a layer at the bottom of the bottle.

Such so-called 'medical men and dispensers' are really a grave source of danger to the public. I should like to congratulate this lady on her recovery in spite of the combined efforts of both prescriber and dispenser.

There was one fatal case of chloroform poisoning in the year where some men and women had a drinking bout and drank pure chloroform instead of country spirit. One man died with all the typical symptoms, signs and post-mortem appearance of chloroform poisoning. Chloroform was detected in all the organs submitted for analysis.

Choice of anæsthetics in India

During the year 25 samples of chloroform were examined and all were found fit for anæsthetic purposes;

on the other hand, 19 samples of ether were examined and 7 were considered unfit either due to the presence of organic peroxides which are very poisonous or aldehydes which are less toxic. No deaths were due to chloroform administration but there were some very unfortunate deaths under ether. I believe quite a number of medical men are afraid of giving chloroform and therefore select ether. Even though I belong to the Edinburgh School of Medicine my Indian experience has convinced me that chloroform is a safer anæsthetic in the tropics than ether, particularly in the hands of officers in charge of the smaller hospitals who are called upon occasionally to give anæsthetics. The specialist in anæsthetics in a big hospital who anæsthetises daily is in a different position as he can keep his hand in and commands a regular supply of fresh anæsthetics. As ether deteriorates quickly, it is quite possible that when the ether was administered it was quite good but in the intervening time injurious organic compounds have formed and the sample is certified unfit for use. I venture to suggest that many deaths attributed to ether are really due to surgical shock especially in the hot weather as ether is so very volatile that the patient cannot be brought fully or sufficiently under the anæsthetic.

Deaths in military hospitals are far more common than in civil hospitals, notwithstanding the greater number of operations carried out. This is a very significant fact.

A report based on circumstantial evidence

A small piece of decomposed intestine was sent from an Indian hill state for identification as to whether it belonged to a human being or an animal. It was too decomposed for the serological test.

On microscopic examination the following points were elicited:—

- (1) Longitudinal striae.
- (2) Complete bhag leaves with spines.
- (3) One small hair which was that of a goat.

On this evidence, the report was that the exhibit was a piece of large intestine of an animal probably a goat.

ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR THE YEAR 1930. VOL. II. CALCUTTA: GOVERNMENT OF INDIA CENTRAL PUBLICATION BRANCH. 1932. PRICE, RS. 2.

THIS volume contains the sections on the health of the British and Indian troops in India. It is a very interesting and important report. When it is recalled that the mortality in British troops in India in 1869 was 60 per 1,000 and that in 1930 it was 2.78 per 1,000, we are prompted to enquire how this has been brought about and how such a low mortality is being maintained. The Indian Army mortality in 1869 was 20 per 1,000 and in 1930 it was 3.16 per 1,000, so that both armies have shared in the benefits. The story of this achievement is a long one and was given by Lieut.-Col. Mackenzie in an interesting volume which we reviewed some time ago. The present report gives some idea of the machinery now at work in keeping up the health standard of the armies in India. One, or perhaps two, of the most notable advances in recent years have been, firstly, the provision of adequate laboratory facilities and the encouragement of their use and, secondly, the encouragement of honesty in diagnosis. Twenty years ago, pyrexia of uncertain origin was a favourite receptacle for the laziness, indifference, and fear of the army doctor. Later, pyrexia of uncertain origin was considered to be a reflection on his capacity as a sanitarian and as a medical scientist. To-day however the term is used in its true sense to denote the uncertainty of diagnosis of a case where all the methods of examination available to the medical officer have failed to give positive results, and where clinical symptoms are not sufficiently well determined to justify a diagnosis. The analysis of a series of case cards during 1930 showed that there was still a tendency to cloak uncertainty under headings

such as myalgia, headache, constipation and intestinal toxæmia, and that many such should really have been returned under the diagnosis of pyrexia of uncertain origin. The question is further complicated by the fact that an increasing number of bacteriologically proved abortive typhoid and para. A infections are being brought to light in which few or no symptoms are present other than periods of very short pyrexia, headache and constipation, the Widal test showing little or no rise in the agglutinative curve. The method suggested of dealing with this difficult question would appear to be that of appointing specially selected officers to carry out researches along similar lines in selected stations. This should undoubtedly be done and will be of great interest and service to the profession in India.

As stated above, the mortality of British troops in India was 2.78 per 1,000 in 1930. Amongst officers it was 5.95 and amongst children 12.29. The last figure is high and justifies the greater interest now being given to maternity and child welfare work in India under the auspices of the Chelmsford League. The report contains so much of detailed interest that it is difficult to summarize; and we note only a few of the special features.

Sandfly fever was a serious item of disability in the North-West Frontier and the Punjab. The importance of employing 'salted' troops in areas where sandfly fever is endemic was well brought out by the incidence among the various troops in Peshawar district. The 1/3rd Gurkhas for instance, who were entirely 'unsalted', had an admission ratio of 480 per 1,000 compared with 30 per 1,000 amongst the other Indian troops.

Enteric fever is always of importance. Typhoid, para. A, para. B and para. C all occur in India. Typhoid is commonest (122 cases); of para. A 45, para. B 2 and para. C 9 cases were diagnosed, while 116 cases were classed as 'enteric group'. There was a reduction in cases both amongst the British and Indian troops, para. A cases being proportionately higher in both groups owing to improved diagnosis. Practically all troops are now protected by inoculation of 2 doses ($\frac{1}{2}$ c.cm. and 1 c.cm.) of T. A. B. instead of 1 c.cm. The drop in the figures of the Indian Army is gratifying. During the last few years there has been a steady rise in these figures due to improved diagnosis; the drop in 1930 therefore means a real reduction in incidence. The comparatively large number of abortive cases has already been noticed, one case had only 36 hours pyrexia with no other symptom. *B. typhosus* was isolated from his blood. The value of repeated blood cultures carried on later into the disease has been again proved, and cultures should be kept for 8 or 10 days before giving a negative report. Wilson and Blair's medium has not given much success in stool examinations. Agglutination tests with H antigens by Dreyer's method are proving of definite value in diagnosis.

Dysentery and diarrhoea.—The admissions for these continue high and, as the report states, it may seem surprising that with the enormous strides that have been made during the past 26 years in military sanitation, the incidence of this intestinal group of diseases should not have fallen in proportion. Flies, and the proximity of insanitary cities, cantonments and bazaars are given as the cause of the continuance.

Of the dysenteries examined, 64.8 per cent. were bacillary and 14.6 protozoal and in 20.4 per cent. the actual cause was not discovered. Mild Flexner infections probably make up the large proportion of the last class. A large number of diarrhoeas are giving positive results for Flexner and Shiga bacilli and every encouragement is given to cases of diarrhoea to report at hospital for examination and treatment. Such cases must be fertile sources of infection.

Hepatitis and liver abscess are steadily diminishing. The work on dysentery initiated by Major Manifold and now carried on by Major Boyd is still yielding interesting matter. Boyd (*R. A. M. C. Journal*, 1931) has discovered certain strains of *B. flexner* comparatively common in India antigenetically distinct from those of Andrewes and Inman and hitherto hidden in the group

of inagglutinable strains. *B. flexner* type appears to be the commonest strain in India. There are interesting graphs in this section showing (1) the rise in the incidence of diarrhoea due to the necessity for admitting and examining all cases of diarrhoea, (2) the drop in the amoebic dysentery and the rise in bacillary dysentery due to better laboratory diagnosis, (3) that there has been comparatively little drop in the admissions for dysentery, diarrhoea and colitis since 1905.

Malaria plays a definite part in the diseases of the army. In 1930 there were 118.43 admissions per 1,000. There has been a drop in malarial admissions since 1927 due to longer residence in the hills mainly. Prophylactic quinine (10 grains per diem) was given to all troops in the plains in September and October; the malaria there was undoubtedly less than might have been expected, but the usual rainfall failed and this may have been the cause of lessened incidence and not the quinine. It was shown in the anti-malarial centre that 0.03 grms. of plasmoquin per diem for 21 days gave equally good results as 0.04 gramme. Anti-malarial officers in the most important stations have now been given a definite tenure of appointment—this is a move in the right direction.

Oriental sore; combined treatment by infiltration with berberine sulphate and intravenous injection of sodium antimony tartrate has given better results than either alone. Neostibosan did not appear to have any striking superiority over sodium antimony tartrate.

Veneral diseases; a satisfactory decrease of 317 admissions was recorded. Gonorrhoea is the chief disease. The highest admission rates come from Burma and Delhi, Barrackpore and Madras. Bareilly has the lowest figure.

There is an interesting note on *trachoma*. Slight manifestations of this resulted in hundreds of rejections of recruits, especially in Sikhs. The rejections were so high that it was decided to enlist 'mild' trachoma cases who could be treated for three months in hospital if necessary. The results have been good. The disease in its mild form is apparently susceptible of successful treatment and is not so virulently infective as was anticipated.

The chapter on pathology records the immense amount of routine and special work done in the hygiene laboratories of the army. If trained personnel and equipment could be made available closer to the bedside in all military stations, surprising results would undoubtedly follow. The problems of the origin of the practically undiagnosable short pyrexia and so-called pyrexia of uncertain origin would probably be the first to be solved. Despite difficulties of retrenchment the pathologists and hygienists of the armies in India are to be congratulated on the splendid results already achieved.

The report should be widely read by all public health workers and pathologists in India.

MUNICIPALITY OF SINGAPORE. HEALTH DEPARTMENT, ANNUAL REPORT FOR 1931. PRINTED BY PRINTERS LIMITED, SINGAPORE, 1932.

DR. HUNTER's annual reports are always worth reading. He has had a long experience of Singapore and has seen many changes, particularly in housing, water supply and sewage disposal in the town. His observations on disease are shrewd, and in particular of course he has tackled malaria in Singapore and Johore dealing with both the *A. maculatus* and *A. ludlowii* problems. The year 1931 in Singapore was a particularly hard one for the masses of Chinese who are either domiciled there, or who have drifted there from other parts of Malaya on account of the slump in cotton and tin. Severe economic stress has not been reflected in the gross vital statistics as we might have expected. The crude death rate was 25.2 per 1,000 compared with 27.73 in 1930, the birth rate 37 compared with 35.7 in 1930, the infantile mortality rate 204.3 compared with 219 in 1930. Destitution was keenly felt in the lower classes and the child welfare clinics did a great deal of good by getting

into touch with starving families and saving many of the children.

Dr. Hunter does not claim that the lowered crude death rate meant healthier conditions. He thinks that by the middle of the year most of the decrepits and unfits had been weeded out by the financial depression and that their share towards the death rate was thus lessened. As has been stated in some other reviews of the health of tropical towns, the real fundamental problem is tuberculosis and not cholera or plague or smallpox. It is so in Singapore. As a matter of fact there was neither cholera, plague nor smallpox present in 1931. Tuberculosis and pneumonia however together account for 26 per cent. of all the deaths. Dr. Hunter has not much faith in tuberculosis clinics and sanatoria—the only way is to go straight for the root of the problem and wipe out the slums. In his more hopeless moments he prays for another fire of London but bemoans the efficiency of the city fire brigade. Malaria was definitely less than in the previous year—there is one large *A. ludlowii* breeding place, Kallang Basin, which is very difficult to tackle. The breeding however was much the same as in previous years which leads Dr. Hunter to think that the mere quantitative amount of carrier breeding is not the only factor in producing malaria. Enteric fever is still a serious factor in mortality, though infantile diseases after respiratory disease are the chief cause of general mortality. There is an excellent system of maternity and child welfare clinics, which are becoming increasingly popular. The Malayan mother is shy, but is rapidly discovering the benefit of the clinics. There is excellent co-operation between the clinics and the hospitals, which is an essential point in welfare work. Reports from the municipal laboratories testify to the large amount of interesting work done there, both routine and special. Important investigations are being carried on in regard to treatment of sewage—bio-flocculation (by which is apparently meant agitation by paddles with a form of activated sludge) has been found to be a useful intermediary for sedimentation tank fluid preliminary to putting this over filters. There appear to be many scattered purification plants of the septic tanks plus filter type not connected with the sewage system. Alterations in these to the two-storey Imhoff type have produced appreciably better results.

The population of Singapore on April 1st, 1931, was 445,719. A 'check' by the public health department after the census revealed a deficiency of 19,297 children in the 0-5 group which the health officer thinks should be added to the official census figure. It seems difficult to see how such a large number of children escaped the official census. The method of estimating intercensal populations by geometrical progression has been found for Singapore to be faulty; the yearly difference in population is better given by adding the natural increase plus a proportional increase of immigration over emigration for the figures for the whole country.

The report is interesting and not too long. It illustrates the fact, we think, that public health methods in towns are essentially the same all over the world and that 'tropical diseases' *per se* do not constitute the real fundamental difficulties in towns in the tropics.

FIFTY-SIXTH ANNUAL REPORT OF THE CHEMICAL EXAMINER'S DEPARTMENT, BENGAL, FOR THE YEAR 1930. CALCUTTA: BENGAL SECRETARIAT BOOK DEPOT, 1932. PRICE, ANNAS 8 ONLY.

The major part of the report is naturally devoted to the records of routine examinations, but among the medico-legal notes there are one or two unusual cases of poisoning.

The viscera of two boys forwarded from Assam were found to contain strychnine. The history was that shortly after being given some white powders for 'worms', symptoms of poisoning occurred with death one hour later in one case, and one and a half hours

later in the other. They appear to have been given strychnine in mistake for santonine.

Two Santhals died after being given *pachwai* (country liquor) to drink and *biri* (cigarettes) prepared from leaves and tobacco and a root-like substance. Both men smoked from the same cigarette and complained of a burning sensation in the mouth and stomach soon afterwards. One died at midnight the same day and the other the following morning. Samples of both the liquor and cigarettes forwarded for examination were free of poison, but the accused submitted a root-like substance to the police and confessed he had placed a portion of it in the cigarettes. This substance was found to contain aconite, traces of which were also present in the vomit of the deceased. These cases are apparently aconite poisoning from smoking.

A Hindu woman was attacked by her nephews one night while asleep and severely handled by them. They then ran away and she felt a burning sensation over her body, and found some broken pieces of a conical-shaped substance stuck near her breast, and other similar fragments in her bed. *Abrus precatorius* was detected in the fragments. The woman did not die, but the case is of interest in that this form of poisoning is rare in human beings though common in cattle.

Correspondence

THE ÆTIOLOGY OF BLACKWATER FEVER

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I am enclosing a few clinical observations on blackwater fever. There seem to be three seasons for malarial infection as observed in the European staff:—one about February to March, another about July to August and the last about October to November.

Another point is that there is a prevalent belief that five grains of quinine daily will prevent an attack of malaria, and this is taken nearly the whole year round. When an attack of malaria comes on, a couple of injections are given and quinine is taken, at the most ten grains, until the patient is free from fever. He then takes five grains daily and if he feels feverish he increases the dose to ten grains. What happens is that an infection is not eradicated, the parasites are kept below the fever level, the spleen is usually big, and this goes on until the next season when fresh infection comes on.

When I came here there were a number of planters with big spleens and it was very difficult to get them to realise that bigger doses of quinine are required to eradicate an infection. They have a strong objection to twenty grains or even fifteen, as it causes dizziness, and, they also say, blackwater fever.

What I am trying to explain is that a patient seems more susceptible to blackwater fever if he gets a fresh infection of malaria on top of a previous infection that is not cured. That quinine also plays some part in producing blackwater fever there is no doubt, and I have seen persons who can produce blackwater fever at will.

There are some non-immunes who get blackwater fever with their first attack of malaria but the majority are I think in group 4. These can be prevented if every attack of malaria is thoroughly treated with quinine or atabrin, preferably the latter, as it causes no symptoms of dizziness, etc., and only takes five days, against the three weeks course of quinine.

The position of the Pahariahs or hill coolies is very interesting. These are non-immunes from Nepal, and McCutcheon, quoted by Strickland, says that though they suffer from the most severe types of malaria they seldom get blackwater fever.

Either the disease has been missed in them or there may be something in the theory that it is prevented by their habit of drinking *haria* or *doupani*. This is a fermentation of rice due to a *saccharomyces*. Perhaps

the vitamine 'B' in the yeast may have some action on the liver or the digestion?

Unfortunately recruitment from Nepal has been stopped so one cannot follow up these cases.

From what I can see there are a number of causes of blackwater fever and I have placed them in the following groups:—

Group 1.—Those who have an inherited sensitiveness to quinine and get hæmoglobinuria after the smallest doses of quinine. Amongst these are the cases in England who have never been in the tropics.

Group 2.—Those who acquire a sensitiveness to quinine due to prolonged use of five grains daily as a prophylactic.

Burgess (British Medical Association meeting, 1932. Dermatological section) has shown that quinine dermatitis may occur due to the presence of quinine in shaving lotions. These persons can be desensitised by small doses of quinine by the mouth. Perhaps the same thing occurs here.

Group 3.—The non-immune who gets a virulent infection and goes down with blackwater fever with his first attack. The work on monkey malaria explains these cases. No quinine need be taken. This type explains those cases with a history of short residence. They should leave the hyperendemic area.

Group 4.—The non-immune, already suffering from malaria, who gets another seasonal infection. This class usually have big spleens and suffer from low fever off and on. The fresh infection superimposed on an old one makes them more susceptible to blackwater fever than group 3. No quinine need be taken.

Into this group come the majority of cases. I have recently had a case to explain this. Mr. D., European planter, had blackwater fever in 1928. When I came here he had a very enlarged spleen. I insisted on his taking big doses of quinine until the spleen had gone down. He was also getting irregular fever. About ten days ago he had an attack of malignant tertian malaria (blood positive), with high fever, vomiting, and diarrhoea from which he collapsed. He had no blackwater fever, but I feel certain he would have got it if he had had an underlying dormant malaria. About this time 6 other cases of malaria in the European staff, including myself, all got fever. The blood showed malignant tertian parasites. These were obviously fresh infections and not relapses. So far I have had three attacks but every attack has been treated thoroughly and thus I hope to prevent blackwater fever. I never suffered from malaria before I came here. Mr. D. was treated with 3 quinine injections followed by atebrian and plasmoquine.

Group 5.—A mixture of group 2 and group 4.

Yours, etc.,

C. McGUIRE, D.T.M. (Cal.), L.M.F. (Bengal),
Medical Officer.

NEWLANDS TEA ESTATE,
NEWLANDS P. O.,
EASTERN DOOARS,
8th September, 1932.

[Note.—The words 'blackwater fever' should surely be confined to a specific symptom-complex associated with malarial infection, and should not be applied to all forms of hæmoglobinuria. It is possible that there is some association between quinine hæmoglobinuria and malarial hæmoglobinuria, or blackwater fever, but to refer to uncomplicated cases of the former condition as blackwater fever is likely to add to the confusion that already exists.—EDITOR, I. M. G.]

THE ANÆMIA OF PREGNANCY (Corrigendum)

To the Editor, THE INDIAN MEDICAL GAZETTE
SIR,—With reference to a statement in my paper on 'The Anæmia of Pregnancy' published in the August 1932 number of the *Indian Medical Gazette*, page 431,

para 9, Lieut.-Col. Green-Armytage informs me that he does not perform even small transfusions without blood grouping.

Yours, etc.,

DR. N. GUPTA, M.B., M.R.C.P. (E.), D.P.H.
(Camb.), D.T.M. & H. (Lond.).

DEPARTMENT OF PATHOLOGY,
MEDICAL SCHOOL,
DACCA,
14th September, 1932.

Service Notes

APPOINTMENTS AND TRANSFERS

LIEUTENANT-COLONEL A. H. PROCTOR, officiating Professor of Surgery, Medical College, Calcutta, on return from leave granted to him, is appointed as Surgeon Superintendent, Presidency General Hospital, Calcutta, *vice* Major H. E. Murray.

Lieutenant-Colonel E. H. Vere Hodge, officiating Professor of Medicine and First Physician, Medical College, Calcutta, on relief by Lieutenant-Colonel J. D. Sandes, is posted as Civil Surgeon, Howrah.

Lieutenant-Colonel N. C. Kapur, on relief by Lieutenant-Colonel E. H. Vere Hodge, is posted as Civil Surgeon, Chittagong.

Lieutenant-Colonel J. A. Sinton, v.c., o.b.e., Director, Malaria Survey of India, Kasauli, is appointed to hold charge of the post of Director, Central Research Institute, Kasauli, in addition to his own duties during the absence on leave of Brevet-Colonel Sir Rickard Christophers.

The services of Lieutenant-Colonel J. B. Hanafin, C.I.E., are placed temporarily at the disposal of the Chief Commissioner, Aden, with effect from the 6th April, 1932, for employment as Port Health Officer, Aden.

Lieutenant-Colonel B. F. Eminson, on return from leave, is appointed as Civil Surgeon, Dharwar, with attached duties.

The services of Major R. S. Aspinall are placed at the disposal of the Chief Commissioner, Delhi, for appointment as Civil Surgeon, New Delhi, with effect from the 16th October, 1932.

Major H. Williamson, o.b.e., is appointed substantively to be Agency Surgeon under the Government of India in the Foreign and Political Department, with effect from the 28th August, 1932.

The services of Major P. H. S. Smith are placed at the disposal of the Government of the North-West Frontier Province for employment in the North-West Frontier Province Jail Department, with effect from the date on which he joins his new appointment.

The services of Captain H. W. Mulligan are placed on foreign service under the Indian Research Fund Association, for appointment as Assistant Director, Malaria Survey of India, Kasauli, with effect from the date on which he assumes charge of his duties.

The services of Captain M. Taylor are placed temporarily at the disposal of the Government of Bihar and Orissa, with effect from the date on which he assumes charge of his duties.

The undermentioned appointments are made:—

To be Captain (on probation)

G. R. M. Apsey, 20th April, 1932, with seniority 22nd May, 1931.

To be Lieutenants (on probation)

W. H. G. Reed, 2nd August, 1932.

T. E. Palmer, 2nd August, 1932.

W. J. Poole, 2nd August, 1932.

C. J. H. Brink, 25th August, 1932.

LEAVE

Brevet-Colonel Sir Rickard Christophers, Kt., C.I.E., o.b.e., F.R.S., I.M.S. (retd.), Director, Central Research

Institute, Kasauli, is granted leave on average pay for 1 month and 28 days, with effect from the afternoon of the 31st August, 1932.

Brevet-Colonel G. D. Franklin, C.I.E., O.B.E., K.H.S., is granted leave on half average pay for 3 months, with effect from the forenoon of the 9th August, 1932.

Lieutenant-Colonel H. E. Stanger-Leathes, Deputy Director-General, Indian Medical Service, is granted leave on average pay for 8 months, with effect from the 28th October, 1932, and his services are replaced at the disposal of the Army Department, with effect from the date of the expiry of the leave.

Major G. Covell, Assistant Director, Malaria Survey of India, Kasauli, on foreign service under the Indian Research Fund Association, is granted leave on average pay for 8 months, combined with leave on half average pay for 4 months, with effect from the 10th October, 1932, or subsequent date from which he may avail himself of the leave. His services are replaced at the disposal of the Director-General, Indian Medical Service, with effect from the date on which he proceeds on leave.

Major B. H. Singh, M.C., Civil Surgeon, Burdwan, is allowed leave on average pay for 2 months and 15 days, with effect from the 2nd September, 1932, or the date of availing.

PROMOTIONS

Colonel to be Major-General

E. A. Walker, V.H.S. Dated 24th September, 1932.

Lieutenant-Colonel to be Colonel

E. W. C. Bradfield, C.I.E., O.B.E. Dated 11th September, 1932, with seniority from 28th February, 1927.

Brevet-Colonel to be Colonel

A. W. M. Harvey. Dated 24th September, 1932, with seniority from 3rd June, 1921.

Captain to be Major (provl.)

D. P. Bhargava. Dated 5th December, 1931.

Lieutenant to be Captain

G. Milne. Dated 4th February, 1932.

Lieutenants (on probation) to be Captains (on probation)

D. P. Mitra. Dated 1st September, 1931.

T. D. Ahmad. Dated 6th October, 1931.

Lieutenant (on probation) to be Captain (provl.) (on probation)

J. R. Dogra. Dated 25th August, 1932.

RESIGNATION

Lieutenant D. L. Trant. Dated 20th August, 1932.

RETIREMENTS

Major-General C. Hudson, C.B., C.I.E., D.S.O., K.H.S. Dated 24th September, 1932.

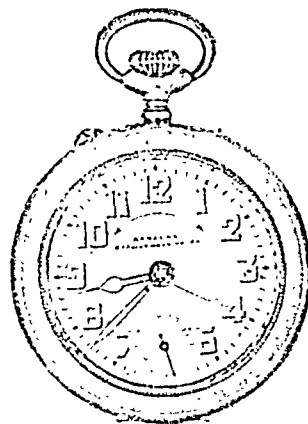
Major G. Shanks. Dated 26th August, 1932.

Notes

TWO USEFUL TIMEKEEPERS

We have examined two inexpensive watches of good appearance which may prove useful to the medical man both in private practice and for general use. The first is a 30-hour stop-watch with lever movement which is guaranteed for two years. The dial is graduated in one-fifth seconds, distinctly marked, and has a long second hand by means of which accurate pulse readings can be taken. The watch is made in a form suitable for placing on the consulting room table or for carrying in the pocket, as well as for wearing on the wrist; the prices

are respectively 10s. 6d. and 15s.; this particular watch we have tested personally and found entirely satisfactory. The second is an appointment alarm watch, also with lever movement and a bell inside the back of the case, which rings for some twenty seconds and can be easily set to 'go off' at any time by moving a pointer to the hour required. A reminder can thus be obtained of an appointment or of anything which requires to be done at an approximately fixed time. This watch is guaranteed for three years and is sold at 25s.



No. 4.

Arnold's Appointment Alarm Watch. Rings at any required time for any manipulation. Three years guarantee.

Price 25/-.

The watches can be obtained from Messrs. Arnold and Co. of 122, St. John Street, Clerkenwell Road, London, E.C.

SUB-ACIDOSIS AND SALVITÆ

THE symptoms and signs of sub-acidosis, with which the practitioner is so often confronted, may include lassitude, nausea, headache, anorexia, insomnia, muscular pains and aches, acid mouth, sour stomach, migraine, acid perspiration, highly acid urine and a gouty disposition.

The readers of this journal are invited to apply for literature on this interesting subject and the important rôle Salvitæ plays in combating such conditions. Samples of this preparation will also be gladly furnished upon application to the manufacturers, American Apothecaries Co., 299, Ely Ave., Long Island City, New York, or to their agents, Messrs. Muller, Maclean & Company, Inc., Bombay (Hashim Building, 38, Churchgate Street, Fort), and Calcutta (Manowar House, 43, Bentinck Street).

AN EXCELLENT AND HYGIENIC SUBSTITUTE FOR WATER AND AIR BEDS

THE 'Harco' sponge rubber-built hygienic mattress is made of the best quality sponge rubber built up in tiers, and finally enclosed with best quality red waterproof bed sheeting. Being covered with this sheeting it will stand all acids, and it can be easily cleansed with the majority of disinfectants. It takes the place of water and air beds; it is soft, resilient, cannot sag or become lumpy, and is well ventilated. It is easily handled and by using it blowing, filling, repairs, or valve trouble which is a drawback with air and water beds, are obviated. It is indispensable for the relief of those afflicted with urinary and bladder diseases, also the bed-ridden and paralysed. It is also very useful in cases of fractured spines.

Messrs. Cassell Andrews and Co., Ltd., guarantee the 'Harco' mattress for 10 years, as it is specially prepared for tropical climates. Full particulars, prices, etc., may be obtained on application to the firm at Hardman Works, Hardman Street, Manchester, who give prompt and careful attention to all enquiries.

STABLE PREPARATIONS OF DIGITALIS

'DIGINUTIN', which was introduced by Burroughs Wellcome & Co., Snow Hill Buildings, London, as a stable solution of the total glucosides of digitalis leaf, is now also available as 'Tabloid Diginutin', a compressed product of uniform potency embodying the advantage of convenience of administration especially for ambulatory patients. The strength of 'Diginutin' is adjusted to correspond with that of standard B.P. tincture. 'Diginutin' may be prescribed to greater advantage whenever tincture of digitalis is indicated as, unlike the tincture, it undergoes no diminution of activity. The 'Tabloid' product is issued in two strengths equivalent to min. 5 and min. 10 of 'Diginutin' respectively, in bottles of 25 and 100.

A NEW BONE CLAMP FOR FRACTURES

By A. SIMPSON SMITH, M.A., M.Ch. (Cantab.)
F.R.C.S. (Eng.)

THE vast majority of bone clamps overlook the very obvious fact that, throughout the long bones of the human skeleton, no opposing surfaces are strictly parallel. Only for a few inches in the mid-shaft of the femur is there an exception to this rule.

Such excellent bone clamps as the Lowman's have their gripping power considerably lessened by the lack of adaptation of this principle (figures 1 and 1A).



Fig. 1.

Fig. 1A.

One flange to upper jaw. Great tendency to slip as shown. This takes place whether the bony surfaces are parallel as aa', bb' or wedge shaped as aa', cb'.

A double-levered jaw was an attempt to improve the grip, but even this failed to procure a really effective clasp (figure 2A).



Fig. 2.



Fig. 2A.

The non-parallel surfaces have been exaggerated for clarity. Such a state actually exists at the ends of all the long bones. P. represents the only theoretical point of contact of the upper jaw. One fragment is therefore loose.

The Oblique Fracture.—The new clamp shown has this 'universal' gripping mechanism grafted upon a

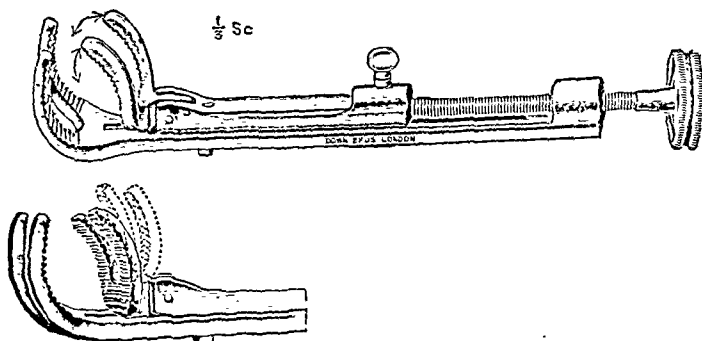


Fig. 3.

Lowman's clamp, and it will be found to give a much more vice-like grip (figures 3 and 3A).

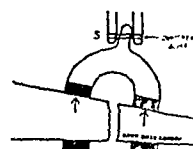


Fig. 3A.

The upper jaw is secure on both fragments by means of the universal joint at J. Note direction of secondary shaft, at right angles to the plane of the lower jaw.

Description.—The features of the Lowman's clamp are retained with the exception of the jaws. Both lower and upper jaws have two flanges, the lower jaw being rigid and incorporated in the frame as in the parent pattern.

The upper jaw is fixed to a 'universal' joint, so that it can accommodate itself to any curve or shape. On screwing 'home', the power is evenly distributed between the two flanges via the central pin and effective rigidity assured.

My thanks are due to the surgeons of the West London Hospital for so generously allowing me to use this clamp on cases under their care.

The instrument is made by Messrs. Down Brothers, who have been most patient and helpful in the production of this tool.

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Original Articles

THE DIAGNOSIS AND TREATMENT OF NON-CONGESTIVE GLAUCOMA

By E. W. O'G. KIRWAN, F.R.C.S.I.

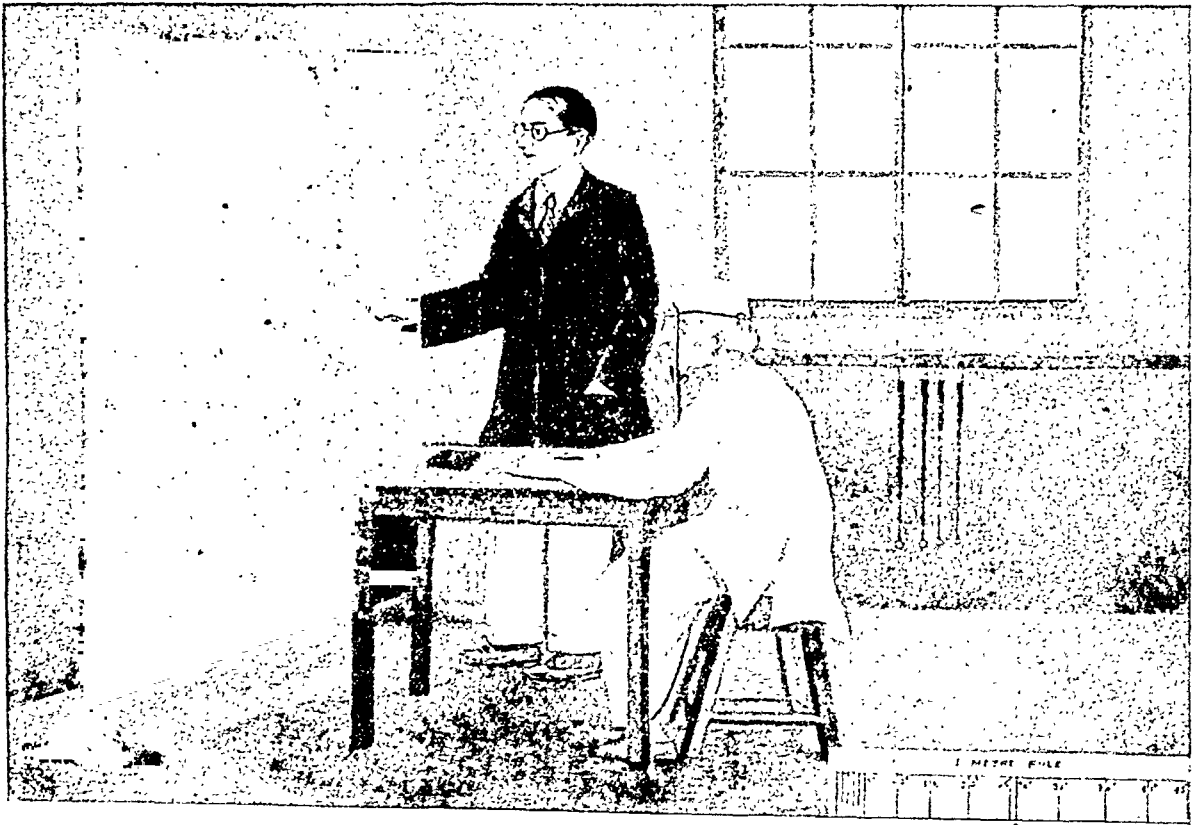
LIEUTENANT-COLONEL, I.M.S.

Professor of Ophthalmology, Medical College, Calcutta

Prior to the year 1856 glaucoma was looked upon as an incurable disease and it inevitably led to blindness. For the discovery of the treatment of glaucoma the world owes a debt to von Graefe; he was the first surgeon to perform the operation of iridectomy for the treatment of congestive glaucoma and so saved large numbers from sinking year by year into complete blindness. India, and indeed the whole world, owes much to Lieut.-Col. R. E. Elliot, I.M.S., who invented the operation of sclero-corneal trephining, which is now univer-

years 1,500 eyes have been operated upon for the relief of glaucoma, making an average of 300 in a year. In the years 1929 and 1930, large numbers of cases of epidemic dropsy occurred in Bengal and a common complication of this disease was glaucoma without any signs of inflammatory disease of the eyes. The glaucoma was of the nature of the non-congestive variety, accompanied very often by very high tension in the eyes, and unless an operation was speedily carried out in many cases blindness from optic atrophy resulted.

By far the commonest glaucoma that we see in India is the chronic primary non-congestive variety, and this is the variety of glaucoma which I wish to bring especially to notice. The symptoms are usually insignificant till the disease is far advanced as inflammatory attacks and pain are never present, and the first symptoms that suggest to the patient that something is wrong are disturbances of vision,



Bjerrum's screen in use.

sally carried out for the treatment of non-congestive glaucoma.

All over India glaucoma is very common but the general practitioner in India appears to be still unaware of the great frequency of this terrible disease. In the large eye hospitals in India very large numbers of people are operated on for the relief of glaucoma and the disease is far commoner throughout the Orient than in Europe and America. In the Eye Infirmary, Medical College, Calcutta, during the last five

which are manifested by transient mild attacks of haziness of vision, rainbow halos around lights, and difficulty of reading necessitating an increase in the strength of his glasses at frequent intervals. But it should be remembered that glaucoma can exist without any of these symptoms being noticed.

There are three signs by which chronic primary non-congestive glaucoma can be recognised by the ophthalmic surgeon. Firstly, glaucomatous cupping of the optic discs which

can be determined by looking into the eyes with an ophthalmoscope. Secondly, the increase of intra-ocular tension which is measured by a tonometer; this increase in tension may be slight or great, and may also be intermittent. Thirdly, the constriction of the field of vision which is measured by an instrument known as a perimeter, or by a Bjerrum's screen. The former is used for mapping out the peripheral zone of the field, the latter for determining the condition of the central zone and the blind spot and is much the more useful of the two. A perimeter is an expensive instrument, but a Bjerrum's screen can be very easily made locally with a black piece of cloth. The charting of the screen can be mapped out by a tangent scale. The measurements of the tangent scale and the Bjerrum screen are shown in the diagram.

It should however be remembered that the Bjerrum's screen cannot replace the ordinary perimeter, but it is of great usefulness in India where so many cases of advanced glaucoma are seen. It is quite the exception in the large hospitals of India to see an early case of non-congestive glaucoma coming for treatment.

Examination by Bjerrum's screen :—It should be remembered first of all that this screen can only be used to study the central 30° of the field.

The patient is seated at a distance from the screen of 1 to 2 metres, a 2-metre screen is to be preferred but a 1-metre screen will probably be found more practical in India. The screen should be placed in a good light and a head rest should be provided for the patient, if possible; a fixation object composed of a white disc is attached to the centre of the screen by a pin with a black head, so that the disc appears as a circle with a black centre. The size of the disc will depend upon the acuity of vision but a useful size is 10 millimetres in diameter. The extent of the field is examined with a white test object of about 5 to 10 millimetres in diameter mounted at the end of a rod which is dull black in colour. The test object is placed on the edge of the screen and is moved towards the fixation object in the centre of the screen. The boundaries of the field which are ascertained by the appearance and disappearance of the test object are mapped out by putting in black pins on the screen. The blind spot is also mapped out in the same way. A record of the field may be kept on a chart which is usually done after the examination is completed. Colour tests may also be done on the screen and are useful to detect early defects in the field.

In cases where the visual acuity is considerably reduced, such as when accompanied by secondary cataract, a small spot light, such as one which can be obtained from the electric ophthalmoscope, can be utilised to make a rough estimation of the field of vision. This is also an excellent way of obtaining an idea of the

constriction of the visual field in illiterate and stupid people. In advanced glaucoma the spot light may be brought into the centre of the field of vision before it is seen. This is unfortunately a very common condition among the cases of glaucoma which come to the eye infirmary in Calcutta. More intelligent people will often tell you that the world appears as though seen through a tube or the barrel of a gun. It should always be remembered that central visual acuity usually becomes impaired only when the disease is far advanced; this means that a person may have normal vision and yet may be far advanced in glaucoma, and it cannot be too strongly impressed upon medical men that glaucoma if untreated leads to blindness and it should be diagnosed as early as possible, for, if recognised late, it is difficult to control. Glaucoma diagnosed early is much more favourable to treatment.

By far the easiest way for the average general practitioner to diagnose glaucoma is to have a practical knowledge of how to estimate the fields of vision and to be able to appreciate when the field of vision is constricted. This he can always do without any difficulty if he takes time and patience with his patient. It may not be possible for the general practitioner to diagnose an increase of intra-ocular tension or the presence of glaucomatous cupping.

It is not the purpose of this article to discuss the cause of glaucoma except to point out that primary non-congestive glaucoma, as seen in India, is a sign of a sick eye in a sick body and is nearly always accompanied by some variety of gross sepsis. In Bengal practically all the cases of glaucoma that come to us are suffering from severe oral sepsis. In the treatment of glaucoma it is of paramount importance to treat the septic focus in addition to the treatment of the eye.

For the treatment of non-congestive glaucoma there are two schools of thought, one which prefers to treat the disease by medicinal treatment alone, and the other school which favours operative treatment. In India the medicinal treatment of non-congestive glaucoma is absolutely unsatisfactory and as soon as the disease is diagnosed an operation to bring back the increased intra-ocular pressure to the normal level should be carried out as quickly as possible. Medicinal treatment by miotics, massage of the eyes and general medical treatment should always be regarded as a temporary expedient to surgical treatment and it cannot be too strongly impressed on medical men that the disease is likely to progress if medicinal treatment alone is carried out. It should be remembered that, the earlier operative treatment is carried out, the better is the prognosis; but it should also be remembered that no matter how late the diagnosis of glaucoma is made, operative treatment should be strongly advised. For the surgical treatment of non-congestive glaucoma the classical operation of sclero-

corneal trephining of Elliot is the most satisfactory. If the disease is diagnosed early a sclero-corneal trephining should rarely fail, but the later the operation is carried out the greater the risk of failure. For the treatment of non-congestive glaucoma the operation of iridectomy alone should not be carried out as it only lowers the tension for a very temporary period and the disease continues to progress.

It should always be impressed on the patient that primary non-congestive glaucoma will almost always sooner or later affect both eyes. The following three cases of non-congestive glaucoma have recently come to my notice, and serve to illustrate how, even amongst intelligent and educated people, cases of advanced glaucoma are still occurring; this can only be attributed to the wrong advice given by the general practitioner whom the patient first consulted when the vision was commencing to fail.

Case 1.—Miss E. C., Anglo-Indian lady, age 78. Teacher in an European School for forty years. History of failing vision for about a year; the right eye was first affected. The failing vision was associated with no pain or inflammation. On no occasion had she seen rainbow halos. In the beginning of 1932 she noticed that she could see nothing from the right eye and in March 1932 she commenced to have difficulty of seeing from the left eye and came to consult me because she had difficulty in reading her Bible. Seen by me on the 17th March 1932, the right eye was completely blind. No signs of inflammation and the anterior chamber was very shallow. The fundus showed advanced glaucomatous cupping and complete optic atrophy.

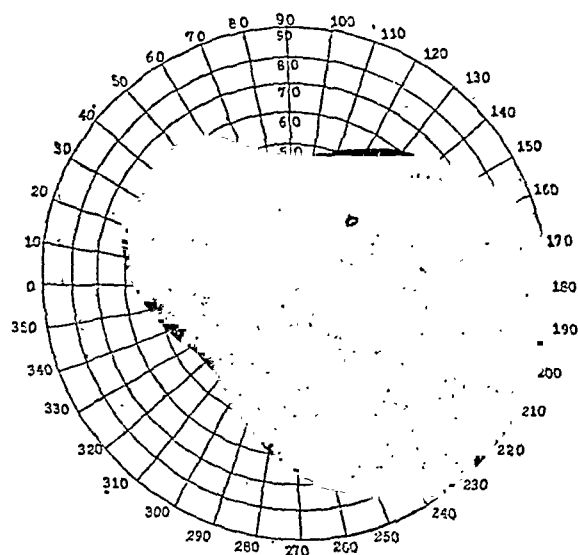
hospital and under observation, the tension of the eyes varied between 30 mm. Hg. (Sciotz) and normal. The diagnosis was made of chronic primary glaucoma in both eyes. The patient had been told by doctors whom she had consulted that she was probably suffering from cataract and would have to be operated upon when the cataract was mature. She was operated upon by me on the 21st March 1932—Elliot's sclero-corneal trephine on the left eye and was discharged from hospital on the 12th April 1932. When last seen by me on 20th June, the field of vision was the same as before the operation and the vision was still 6/18.

Case 2.—Mrs. M. C., European lady, aged 32. Sempstress in a large hospital. History of failing vision in both eyes since November 1931. General health excellent. The failing vision was not associated with pain or inflammation but there were occasional attacks of seeing rainbow halos. The loss of vision commenced in the right eye and the patient when seen by me was commencing to have difficulty in doing her work. Seen by me on the 9th January 1932. There was no sign of inflammation. The tension of both eyes was *plus*; the right eye was blind. Ophthalmoscopic examination showed well-marked glaucomatous cupping in both eyes and advanced optic atrophy. The field of vision in the left eye was reduced to a tube as seen in chart 2. The patient was admitted into the Eye Infirmary, and under observation the tension of the eyes was found to vary from 35 to 50 mm. (Schiotz). No cause could be found for the glaucoma and all examinations proved negative. At times the patient suffered from slight oedema of both legs and it was thought that possibly she was suffering from epidemic dropsy glaucoma which at times is epidemic in Bengal. It is however most uncommon amongst Europeans. Examinations proved however that she was not suffering from this disease.

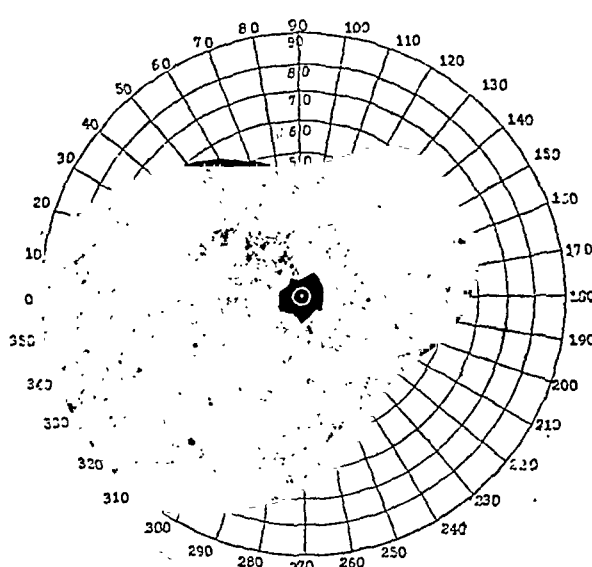
Elliot's sclero-corneal trephine was carried out on both eyes on the 13th January 1932 and 15th January 1932, respectively. At the time of operation the tension was

CHART 1

Test Objects 3/333 + 10/1000. White.



Right Eye.
Vision. Nil.



Left Eye.
Vision. 6/24? with + 2.0 D. S. = 6/18.

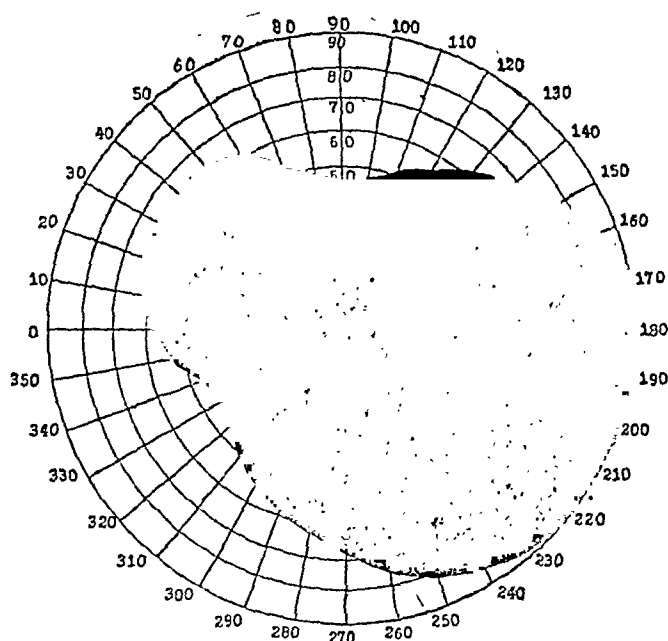
The lens was clear in the centre with peripheral opacities. The tension of the eye was normal.

The left eye. Vision with + 2.0 D. S. = 6/18. Small central field of vision only left, as per chart 1. Shallow anterior chamber, advanced glaucomatous cupping and marked optic atrophy. Admitted into

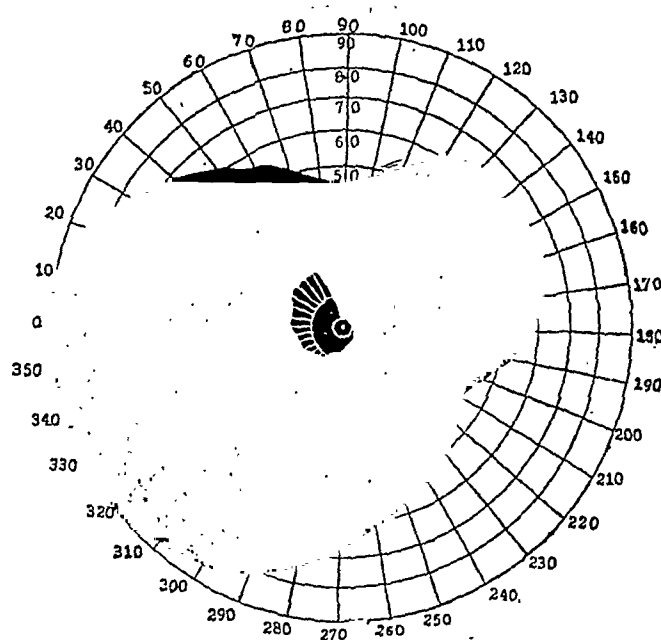
normal. The result of the operation was most satisfactory. She was discharged from hospital on the 1st April 1932 as she was kept for a long time under observation. When last seen by me on the 22nd June 1932, the field was exactly the same as in chart 2, namely before operation, and the vision was 6/6.

CHART 2

White Test Objects 3/333 + 10/1000.



Right Eye.
Vision. Nil.



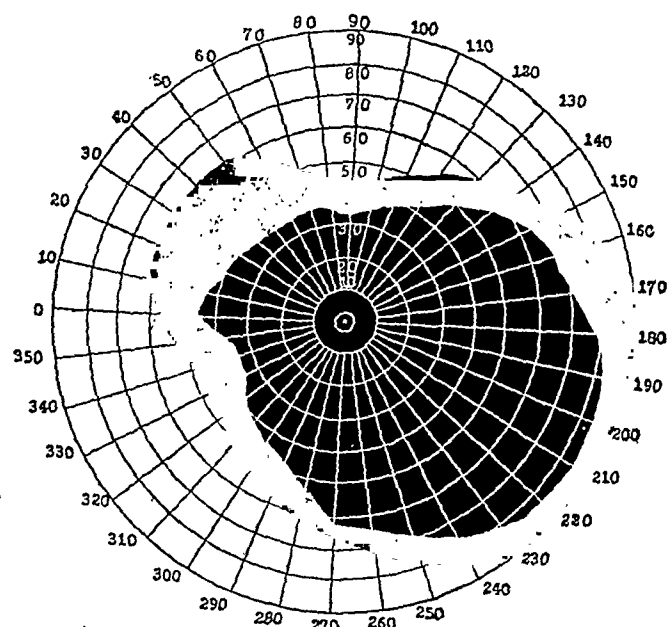
Left Eye.
Vision. 6/6 ?

Case 3.—Mrs. W. H. T., Anglo-Indian lady, aged 49. Complaining of loss of vision in the left eye for the past eight months. General health good. At times she had attacks of slight pain accompanied by seeing rainbow halos from time to time. Seen by me on the 22nd

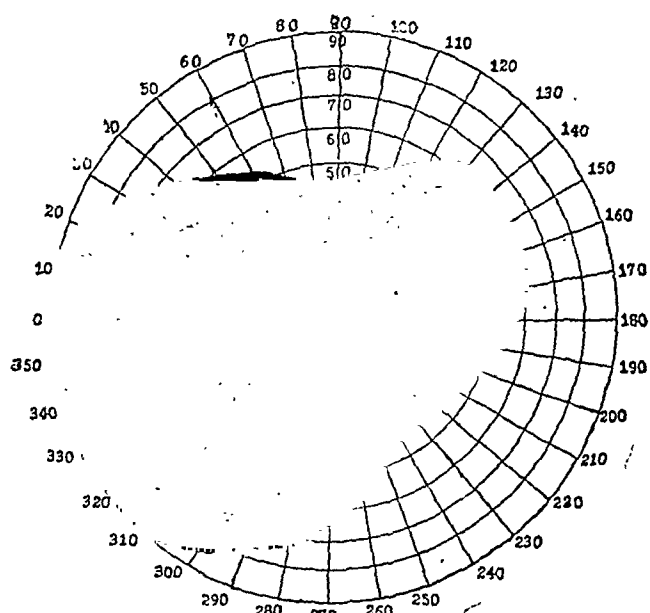
miotics and the left eye was operated upon on the 31st March 1932. The patient was discharged on the 19th April 1932, the tension of the eye was normal, but there was no vision. She was warned that she would sooner or later get glaucoma in the healthy eye and

CHART 3

White Test Objects 3/300 + 10/1000.



Right Eye.
Vision. 6/60 with + 5.0 D. S. = 6/6.



Left Eye.
Vision. Nil.

March 1932. There were no signs of inflammation in the eyes. The tension of the left eye was 55 mm. of Hg. (Schiotz). The vision in the left eye was nil. The pupil was partially dilated, the anterior chamber being very shallow. Ophthalmoscopic examination showed marked glaucomatous cupping and advanced optic atrophy. The vision of the right eye corrected with glasses was normal; the field of vision of this eye was also normal. Admitted into the Eye Infirmary, on the 29th March 1932, the tension became normal under

as soon as she developed any symptoms she should return immediately for operation in this eye. The fields are shown in chart 3.

I now wish to show that if a patient suffering from glaucoma consults an ophthalmic surgeon when the disease is not advanced, with proper appropriate treatment, the eyesight will be retained.

The following two cases recently came to my notice :—

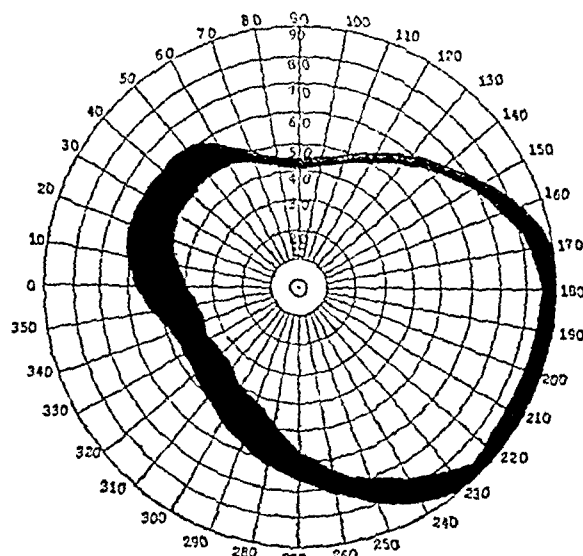
Case 4.—Mrs. D. M., European lady, age 57. In good health and has lived in India for 23 years. Was operated on for chronic glaucoma by Colonel Maynard eighteen years ago, both eyes were done about the same time and the operation was a sclero-corneal trephine. Both trephine holes were filtering, the blebs were flat

cupping, the temporal side of the disc was pale in both eyes, but more marked in the left eye. The fields are shown in the accompanying chart 4, which are examples of glaucomatous fields.

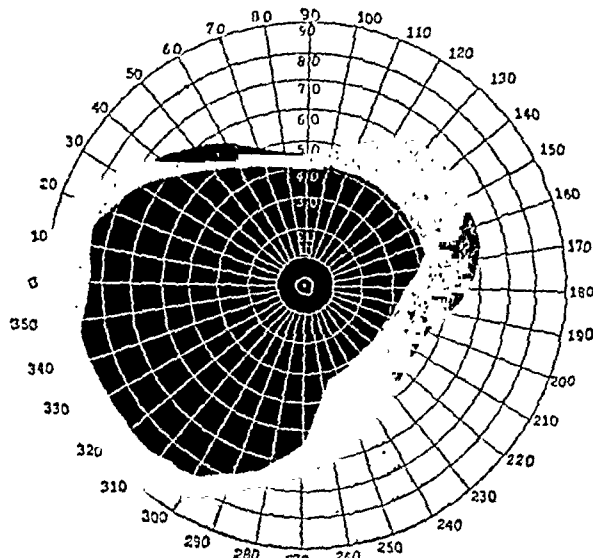
Case 5.—Mrs. S. M., European lady, age 52. Resident in India for 25 years and in good health. Was operated upon for chronic glaucoma in the left eye on the 21st September 1922 by Colonel Coppinger. Elliot's sclero-corneal trephine was carried out. Consulted me

CHART 4

White Test Objects 3/333 + 5/1000.



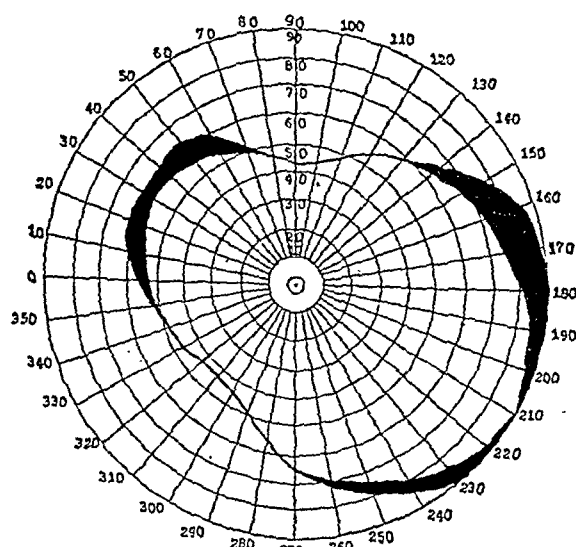
Right Eye.
Vision. 6/9.



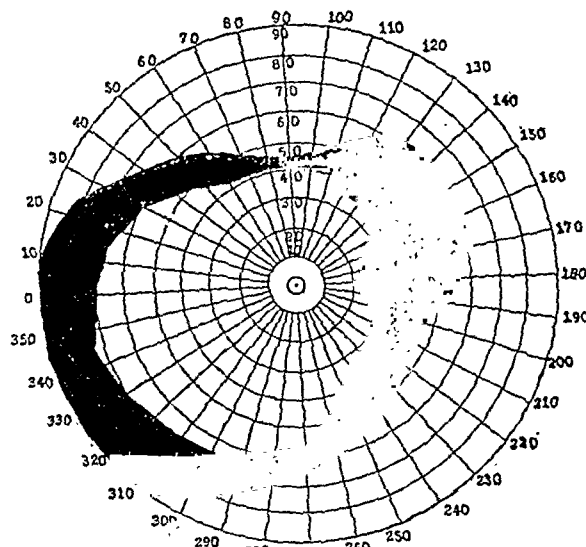
Left Eye.
Vision. 6/6.

CHART 5

White Test Objects 3/333 + 5/1000.



Right Eye.
Vision. 6/9.



Left Eye.
Vision. 6/6 ?

and small. The patient consulted me on the 29th March 1932, as her vision was failing. I found on examination that all she required was a change of glasses and that she was not suffering from active glaucoma. Her vision corrected was right eye—6/9, left eye—6/6. Fundus examination in both eyes showed no glaucomatous

on the 16th June 1931, when she was suffering from chronic glaucoma in the right eye and with a tension of 40 mm. (Schiotz). Elliot's sclero-corneal trephine was performed by me on the 19th June 1931. Recovery

(Continued at foot of next page)

THE TREATMENT OF BACILLARY DYSENTERY BY BACTERIOPHAGE

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The source of the clinical material for the present investigation

THE notes of all patients admitted to the Presidency General Hospital, Calcutta, who were diagnosed as suffering from dysentery during each of the four years 1928, 1929, 1930 and 1931, have been collected and analysed. Cases of terminal dysentery complicating some other disease, of simple amœbiasis with no history of passing blood or mucus, of true amœbic dysentery, acute or chronic, and of mixed infection have been excluded from the analysis, and only referred to for purposes of comparison.

The notes analysed were mainly the work of the registrars and house surgeons of the hospital and varied considerably, both in quality and quantity. Usually the essential points in the history and progress of the case were given, but often the general condition of the patient and other important details were not, and unnecessary particulars, for instance those concerning the patient's family history, sometimes appeared. The number of stools passed daily was noted on the temperature chart and details of pathological and bacteriological investigations and of treatment and diet were given separately. The diagnosis, discharge and result of treatment were nearly

(Continued from previous page)

uneventful. Last seen by me on 12th May 1932. The vision in the right eye was 6/9 and the vision in the left eye was 6/6 partial. Both trephine holes were filtering satisfactorily. The fundi showed no glaucomatous cupping and the fields were as shown in chart 5.

The operative result in both these cases was excellent, both patients retaining practically normal vision over a prolonged period showing that the disease is cured. They are only examples of many cases which are seen in Calcutta, and there cannot be impressed too highly on medical men the importance of recognising glaucoma in the early stages before permanent damage has been done to the eyes. Periodic examinations of the eyes of people over 45 years of age should be done. If a patient complains to you of his eyes blurring whilst reading or seeing rainbow halos around lights, impress upon him the importance of expert advice and be certain that the expert is a skilled ophthalmic surgeon. The average layman, even the educated, is extraordinarily casual about his eyes and entrusts them for examination to an optician who tests his vision and sells him a pair of glasses, and so the disease of glaucoma is not recognised and continues to progress.

always written up by the physician in charge of the case himself. Several cases had to be omitted as so much of the patient's history was missing.

Patients of all nationalities and ages were admitted with dysentery, but the greatest number were young adult Englishmen, with Anglo-Indians next in order. One Indian, a hospital sweeper, is also included in the series and was nursed in the hospital. It will be noted that there were many more male than female patients. This was due to the fact that there were many more male beds available, which reflects in turn the considerably greater number of European men as compared with women in Calcutta. Especially is this the case during the hot and rainy seasons when dysentery is at its highest incidence and many of the ladies have gone off to the more salubrious climate of the hills.

The average Englishman in the East, in contrast to those at home, is generally very good at going straight to his doctor when he is ill. Many of the cases in this series however were admitted several days after they first passed blood and mucus. This was due to various causes; some patients for instance developed dysentery far out in the *mofussil*, or at sea, and did not reach Calcutta for several days. Others were treated by their own private doctors more or less successfully for a few days before it became apparent that hospital attention was advisable.

Mild cases of dysentery can as a rule be treated quite successfully in bed at the patients' own homes, and the average case of bacillary dysentery in Calcutta is of this type. For the more severe cases, however, hospital treatment, especially the trained nursing provided, is very much more satisfactory. In addition to the many patients suffering from bacillary dysentery who could not afford private medical attention in the first place, there were during the year a considerable number of room patients in the hospital who were sent in by their private doctors for this reason.

In nearly every case there was a clear history of passing blood and mucus, and the more observant patient with bacillary dysentery noticed that he passed pure blood and mucus only and no faeces at all from the very beginning of his illness, whereas this did not as a rule happen to the patient with amœbic dysentery until later, i.e., when an ulcer had opened up. Usually diarrhoea was also present—in bad cases severe diarrhoea, and in extremely toxic ones incontinence. Some patients seemed to make a habit of calling for the bedpan almost every few minutes, while others probably more seriously ill could control themselves for much longer intervals. I did not therefore consider it necessary to go too much into individual detail as regards the number of stools passed during the day. In the case notes

the degree of diarrhoea was given to the nearest ten stools passed in the twenty-four hours and the maximum figure during the actual stay in hospital has been taken. Abdominal pain, tenesmus and toxæmia were present in many of the cases to a greater or less extent, depending on the stage and severity of the disease. Unfortunately their presence or absence was not always mentioned in the notes. Generalized abdominal tenderness with rigidity was, as a rule, more severe in cases of amœbic rather than of bacillary dysentery, probably because a greater length of large intestine and also its proximal part was more often involved in the former condition.

Diagnosis

There was usually a considerable improvement in the patient's condition directly he was put at rest in bed, and sometimes quite a long interval before he passed a stool. Unless it seemed a clear-cut case of one sort of dysentery rather than the other, I used to withhold everything except sips of water until this first stool in hospital had been passed and seen by some competent person. If necessary an enema was given or a faecal smear obtained from a catheter introduced into the rectum. Once the stool had been seen and a definite macroscopic diagnosis made, which at any rate in early cases was quite feasible and only rarely had to be corrected later, routine treatment for either amœbic or bacillary dysentery was commenced. Some physicians preferred their patients to have treatment—for example purgatives—from the start.

In all the cases in my series, a specimen of a stool was sent down to the pathological laboratory for examination and culture—in many cases several stools. The microscopical examination of the cellular exudate of a dysenteric stool forms a rapid and, with practice, an easy way of arriving at a diagnosis. Macrophage cells however have to be distinguished very carefully from free forms of *Entamoeba histolytica*; Charcot-Leyden crystals should be looked for and the numbers of blood and pus cells present also form a useful guide. For completely successful bacteriological results stools must be examined and plated while fresh—at any rate within 4 hours of being passed. Unfortunately any stool passed after the laboratory has been closed for the day had to wait till the next and usually failed to grow any dysentery bacilli. Fresh stools were always sent however when available and a positive culture result was obtained in a high proportion of cases. Other investigations performed in numerous instances were routine blood films for malarial parasites if the temperature on admission was over 100°F., blood pictures, especially useful in amœbic hepatitis (I did not see a single case of intrahepatic liver abscess), Van den Bergh reactions to help in the diagnosis of the same condition, and urine analyses and cultures.

General treatment

General treatment consisted always in nursing the patient strictly in bed till the temperature was down and the stools had become normal. In completely incontinent cases the bed linen was changed half-hourly; in others it was insisted that the bed-pan should always be used until orders to the contrary were issued. The diet given was invariably fluid during the acute stage and if toxæmia was great the patient was fed by a nurse. Personally, I used to order fluid protein diet consisting of 6-ounce feeds of citrated milk, whey, Oxo, bael-fruit sherbet, marmite, etc., every three hours for adults with *flexner* infections which were commoner than any other sort because the *B. flexner* does not thrive so well in a protein as in a carbohydrate medium. If the culture report came back '*B. shiga* present', I used to give the patient a fluid carbohydrate diet in which the feeds were citrated milk alone or flavoured with tea, coffee or chocolate, lemonade, barley water, arrowroot and the like—the *shiga* variety of dysentery bacillus preferring a protein to a carbohydrate medium. In other infections and in acute amœbic dysentery fluid feeds, i.e., both protein and carbohydrate, were exhibited. In the next dietetic stage and in mild cases porridge, beaten up egg and milk puddings were added; next fish and minced meat and finally full convalescent diet prior to discharge.

Patients were usually allowed to begin to get up and about directly they felt inclined that way, provided their temperature was down and they had no diarrhoea and were not passing any blood or mucus. If they passed blood or mucus after they were allowed up, i.e., if they relapsed, they were put back to bed and treatment was continued until their motions became completely normal. Often a little mucus, and sometimes quite a large amount, continued to be passed although the patient looked and felt perfectly well. This was particularly the case in amœbic dysentery but it sometimes occurred in bacillary as well. In the notes of this series of cases the dates given for the stools to become normal are taken, like the other details, from the time the patient was admitted to hospital till the first stool containing neither blood nor mucus was seen by the surgeon or house surgeon, and this fact was duly charted. Occasionally, I am afraid, this was not until some time after the event had really occurred, or even not at all, but most of the cases treated with bacteriophage are detailed fairly well. If a relapse occurred and a stool containing blood or mucus was passed during convalescence, this fact is taken into account and the extra days are added although many quite normal stools may have been passed in the interval. I considered the desirability of taking all details of the disease from the very beginning of the attack, but although an accurate history was easily obtained from many patients this was certainly not the case in many more and so I have adhered

throughout to the facts as definitely checked and noted while the patient was in hospital.

Specific treatment

Specific treatment in the form of mixed anti-dysenteric serum was given intramuscularly and intravenously in quite a large proportion of cases, usually in conjunction with purgative treatment. The best results were obtained when it was given early and in massive doses from 40 c.cm. upwards. Serum seemed to me to have a definite effect at almost any stage on the general toxæmia in both *B. flexner* and *B. shiga* infections although, as we have seen, some authorities say *flexner* serum cannot be useful as the toxin produced is intracellular. Vaccine treatment was not tried in any of the acute cases surveyed in this thesis, but reserved for a few chronic and relapsing ones—usually with fair success.

Bacteriophage treatment

The other form of specific treatment employed was bacteriophage and it is my object in this paper to try and find out the efficacy of this substance, and compare the results obtained when using it with those of the other older methods. The bacteriophage used was a clear amber-coloured fluid and was manufactured by the Government Research Institute at Shillong and sold in 2 c.cm. glass ampoules. This particular 'brand' of bacteriophage is made from a large number of strains of dysentery bacilli, and *in vitro* is found to be potent against all the strains commonly encountered in Calcutta. When it first appeared the makers recommended giving one ampoule morning and evening in an alkaline solution, and these instructions were usually carried out; later however the bacteriophage was given more frequently, and in very toxic cases I think it is really best to give it *ad lib.* with occasional alkaline draughts of sodium bicarbonate, 5 grains to one ounce of water. It was always tolerated very well. Bacteriophage works best in an alkaline medium and other drugs, such as bismuth, kaolin, and potassium permanganate, tend to inhibit its action and so should not be given concurrently. In fact, although unfortunately I was not always successful, I endeavoured to have as many patients as possible treated with bacteriophage, and bacteriophage alone, or, if they were very badly dehydrated, bacteriophage by mouth and intravenous saline. Frequently, purgative treatment had been begun before I saw the patient and in mild cases this may have had as much to do with the curing of the condition as the few doses of bacteriophage given.

Although a single dose of bacteriophage may appear to take away all the toxic and other symptoms in a case of dysentery, I do not think it fair to say that bacteriophage treatment has been ineffective unless say at least 3 doses have been given. Nevertheless, for the purpose of this analysis I have had to include a number of

cases, unsuccessful from the 'phage point of view, in which only one or two doses were given at different stages of the illness among others in which a full 'phage course was given alone and from the start of the dysenteric attack. I have usually found that if bacteriophage was going to have any effect at all this usually occurred almost at once. I frequently continued giving bacteriophage until the temperature came down to normal as this was generally the first definite sign of the patient's recovery.

Saline treatment

Foremost among the various methods of treatment of acute bacillary dysentery with drugs come the numerous well-tried purgative remedies. Magnesium and sodium sulphate in drachm doses, four hourly or at shorter intervals, and sometimes more drastic purgatives were given until the stools ultimately became almost completely watery, when treatment was stopped. In mild cases it was often not necessary to continue until this result was obtained as the patient soon stopped passing blood and mucus, and a cure was effected by the flushing out of the bowel. One objection to this well-established and popular line of treatment is that at times it is terribly drastic. The wretched patient complains to his doctor that he is having a stool every few minutes and naturally he wants this state of affairs to cease; instead of this, the actual diarrhoea is definitely made worse by the doctor's treatment although its duration may be curtailed—a fact that the patient does not usually appreciate. In young and otherwise-healthy people the recovery from excessive purging is very quick; they are often constipated for a few days afterwards, but this usually seems to them to be a welcome relief. In aged persons however collapse may easily occur and must always be carefully guarded against. Terminal dysentery with death due to toxæmia and with the actual dysentery not at all severe is, I think, more common in Calcutta than terminal pneumonia. Older patients do not stand purgative treatment well nor in my opinion did anti-dysenteric serum seem to have such a beneficial effect on them as on equally severe infections in younger people.

But, apart from any other consideration and on *a priori* grounds only, purgative treatment seems wrong to me because it is definitely stimulating an already inflamed organ. It is nearly as bad a crime as giving diuretics in a case of nephritis or exercise and movements to an acutely-inflamed joint. Acute dysentery, either amœbic or bacillary, is different from acute ptomaine poisoning or enteritis; in the former, the wall of the large intestine is extensively inflamed and the organisms responsible for the disease are already firmly established in the tissues of this wall; in the latter, cellular involvement is only secondary to some direct

irritant, still mainly in the lumen of the small intestine, and this irritant can and should be got rid of by purgative treatment. Many organisms and toxins are of course present in the large intestine in dysentery cases but I cannot help feeling that most patients can be safely left to get rid of this material themselves. If bacteriophage treatment has no other claim to success at any rate it cannot be said that it makes the patient's diarrhoea worse than it was or in any way stimulates his intestinal tract. Purgative and bacteriophage treatment, if not directly, are at any rate partially antagonistic; purging probably removes the bacteriophage from the gut too quickly for it to have time to work efficiently.

Other drugs useful for symptomatic treatment include, tincture of opium which usually seemed to be effective in reducing the patient's pain and worry even if it had only a minor effect on the diarrhoea, atropine for spasm and tenesmus, strychnine in collapse, and digitalis for elderly patients' hearts.

In severe bacillary cases up to 4 pints of intravenous hypertonic or alkaline saline, as recommended by Asheshov, Khan and Lahiri (1931) for the treatment of cholera, were given; the relative proportions of each depended on the degree of dehydration or toxæmia present. This treatment seemed to me to be more effective than anything else in these cases. The differential diagnosis between severe dysentery and cholera, when there is no stool present to help one, can be extremely difficult and a very similar death from toxæmia can result from each disease. The saline should be given slowly—3 pints in the hour is about the correct rate—and its effect should, and usually did, last long enough to allow bacteriophage to reach the large intestine and in many instances influence the disease process. The clinical picture before and after intravenous saline is sometimes more dramatic than in the case of a successful blood transfusion. It may have to be repeated in very severe cases, but never to the same extent as in cholera. Bacteriophage can be put in the saline solution but I am afraid I did not have enough experience of this to come to any conclusion as to whether its presence helped or not. Most of the patients transfused were already having bacteriophage by mouth.

Bowel wash-outs with saline or alkaline or other solutions were often extremely useful in the later stages of the attack, especially in some instances when given by Plombiere's method. By this means mucus was often got rid of; this method is even more useful in amœbic dysentery. Even in the earlier periods when diarrhoea is not severe I think wash-outs from below may be useful in ridding the patient of harmful material, perhaps more useful than wash-outs from above with purgatives. Bacteriophage also could be put into the alkaline wash-out and would then surely be able to act

quicker and more certainly than if given by mouth. This was actually tried in a few instances but I could not draw any definite conclusions as to its value. It is sometimes difficult to make toxic patients submit to the strain entailed by this treatment and if the gut itself seems to be valiantly trying to cure the disease, interference by the physician is surely not necessary.

Progress

Criteria of improvement in the condition of patients suffering from dysentery may be rather indefinite, especially in mild cases, but usually the disease runs a fairly clear-cut course. Thus the severity of the attack may as a rule be judged fairly accurately by unprejudiced figures indicating the period of fever from the time of admission, and the severity and duration of the diarrhoea. The fever is probably entirely due to, and is in most cases a very accurate gauge of, the toxæmia. It is better to accept this as an indication than to try to assess the toxæmia by other means, as here the personal factor must inevitably play an important part. The severity of the diarrhoea can be expressed as the maximum number of stools passed in a single period of 24 hours in hospital and is here given to the nearest 10, and its duration as the number of days in hospital prior to the passing of normal stools. In cases of relapse this figure will have to be increased to include the whole period up to the final disappearance of this symptom. It must be remembered that purgative treatment in many cases temporarily increased the patient's diarrhoea. The time taken for all symptoms to disappear is obviously dependent on the severity of the disease process but it is also influenced by other factors, the most important of which, in my opinion, is the psychological "make-up" of the patient—the so-called will-to-get-well. In this respect I noticed a great difference between the average English and Anglo-Indian patient, greatly in favour of the former.

The number of days spent in hospital is liable to provide a very misleading figure, as it often influenced by factors quite apart from the recovery of the patient. For instance, he might not have been discharged for several days after he was fit to go as he may have had to wait for dental treatment or perhaps his boat did not leave at a convenient time. On the other hand, he might have been in a hurry to go and discharged himself at his own risk against medical advice, or there may have been a shortage of beds to account for his somewhat premature departure. Some physicians also preferred to proceed rather more slowly with their patients than did others and this undoubtedly influenced the time spent in hospital in many instances. Luckily all these factors tend to cancel out against each other especially when a large number of cases is considered. Another criterion of obvious importance is the

mortality rate, even though it is in this series of cases fairly low compared to other regions of India and the world in general. It must be remembered of course that most of the patients treated at the Presidency General Hospital were well nourished and had very reasonable recuperative powers.

The result of treatment has in the vast majority of instances described been a cure, at any rate in the opinion of the physician in charge of the case. Surprisingly few examples of chronic bacillary dysentery have been found among the notes examined but one or two are described when prolonged treatment for many weeks seemed to make no impression, and blood and mucus continued to be passed day after day. Fortunately some of these were well enough to be invalided home or at any rate to a cooler climate. Relapsing cases were also rare, perhaps rarer than cases of reinfection, probably with some different bacillus. While an attack of dysentery certainly seems to confer specific immunity, at any rate for a short time, it often leaves the general resistance of the gut much lower than before. I had no experience of more-or-less healthy carriers of bacillary dysentery, but I believe many were diagnosed and treated at the School of Tropical Medicine in Calcutta; *B. pseudo-carolinus* I am informed was the organism usually found and treatment consisted of an autogenous vaccine course.

In spite of the difficulties outlined above of showing the exact progress of patients with acute bacillary dysentery I consider that individual variations have been almost completely cancelled by taking, as I have, a reasonably large number of cases. From the detailed statistical results following I hope that some general idea of acute bacillary dysentery in Calcutta may be obtained, and that the efficacy of the old and new methods of treatment can be compared.

TABLE I

Year	CASES ADMITTED			Year's total
	Bacillary dysentery	Amoebic dysentery	Mixed infection	
1928	46	58	9	113
1929	47	57	17	121
1930	70	57	8	135
1931	68	99	15	182
TOTALS	231	271	49	551

Analysis of results

In assessing the various results obtained by analysing the case notes, it must be remembered that only European and Anglo-Indian patients are admitted to the Presidency General Hospital, Calcutta, and that my figures are therefore by no means the same as those for India

as a whole. Thus, in table I, which gives the numbers of dysentery cases of each sort admitted for the years 1928 to 1931 inclusive, it will be seen that the cases of amoebic dysentery actually outnumber those of bacillary although the latter disease is very much commoner in the East. This discrepancy is, I think, due to the fact that most dysentery cases admitted were isolated ones from different reasonably-clean European houses, whereas in Indian villages considerable *B. flexner* epidemics frequently occur and soon become widespread owing to the extremely poor hygienic conditions.

It will be noticed that mixed infections amount to nearly 9 per cent. of the total of my series of cases.

The admissions of each variety of dysentery per month in 1931 are given in table II and the rise in the numbers during the month of August is shown up even more clearly when these figures are set out graphically.

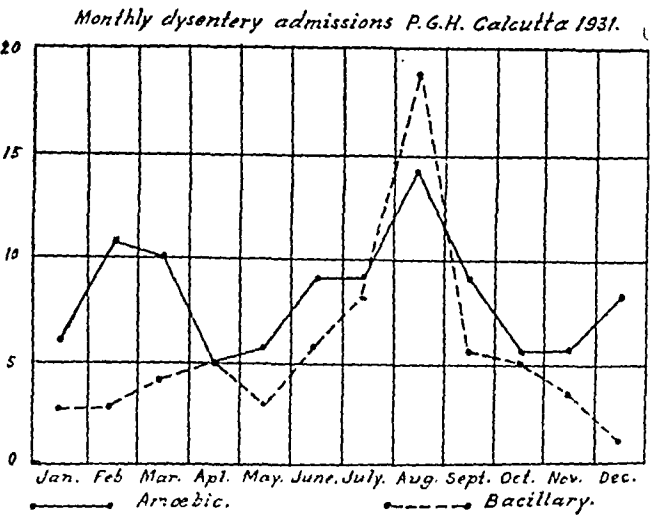


TABLE II

Dysentery admissions month by month in 1931

	Amoebic	Bacillary	Mixed
January ..	6	3	1
February ..	11	3	1
March ..	10	4	0
April ..	5	5	1
May ..	6	3	1
June ..	9	6	1
July ..	9	8	0
August ..	14	19	1
September ..	9	6	2
October ..	6	5	2
November ..	6	4	3
December ..	8	2	2
TOTALS ..	99	68	15

The distribution as regards age of the 231 patients admitted with bacillary dysentery is shown in table III and the race incidence in table IV.

TABLE III
Age incidence

Years	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
Number of cases	36	40	70	42	23	14	6	..
Percentage of total	15	16	35	16	10	6	2	..
Age distribution per centum of all patients in hospital.	15	11	25	18	13	11	5	2

TABLE IV
Race incidence

	Number	Percentage	Race distribution per centum of all patients in hospital
European ..	165	72	61
Anglo-Indian.	61	26	36
Asiatic ..	5	2	3

As regards the sex incidence there is a three to one preponderance of males and this corresponds exactly with the figures for the malaria cases admitted to the hospital during the same four years.

The causal organism was isolated in very nearly 50 per cent. of the total number of cases and *B. flexner* was found three times as often as *B. shiga*—table V. There seem to be three extra cases in this table but this is due to more than one organism being grown from the stools of two patients.

TABLE V
Bacteriological findings

	Number	Percentage
<i>B. flexner</i>	75	32
<i>B. shiga</i>	25	10
<i>B. enteritidis</i>	11	4
<i>B. pseudo-carolinus</i>	2	1
No specific organism isolated	121	53

The proportion of *B. flexner* to *B. shiga* cases does not tally with that usually found in India as a whole and again this is probably due to there being no widespread dysentery epidemic among the white community of Calcutta and the surrounding district.

Incidentally, although only five Asiatic patients—all Japanese—were admitted with bacillary dysentery during the whole period, four of them grew *B. shiga* and I think probably 'carried' the organism with them from Japan.

Altogether there were nineteen deaths which gives a mortality rate of 8.2 per cent. for the 231 cases of bacillary dysentery. Eleven deaths—over half the total number—occurred in children under five years of age. I should like to emphasize once more that dysentery in childhood is a dangerous disease which should be treated as early as possible and preferably in hospital.

I did not find that *shiga* cases were necessarily more severe than *flexner*, either as regards toxæmia or degree of diarrhœa; in four of the cases that died *B. shiga* was isolated from the stools, and in six others *B. flexner*.

Comparison of results of treatment

Of the 231 cases of bacillary dysentery described, 111 had bacteriophage given them and 120 had no bacteriophage. Some patients had only very little 'phage and some had it after many other methods of treatment had been tried unsuccessfully. I have nevertheless placed them all with the more reasonably treated ones in the same 'bacteriophage' category. The control cases received various treatments; thus some forty had purgatives only, another sixty had serum as well, and many in each of these two classes also had bowel wash-outs. The remainder either had general treatment, or serum, or drugs such as kaolin, or were given intravenous saline. They also have all been grouped together into the same 'non-bacteriophage' category.

TABLE VI
Severity of infection

	Percentage positive cultures	Average day of disease on which admitted	Average degree of diarrhœa, i.e., maximum daily stools
111 cases treated with bacteriophage.	51	5	14
120 cases not treated with bacteriophage.	46	4.4	13

The two groups, although they both contain widely varying individual details, are certainly in my opinion comparable as regards severity of infection. This is well shown in table VI

when the average figures are taken and are seen to approximate very closely. As regards the average degree of diarrhoea in hospital, the figures shown were obtained by dividing the total number of stools on the day on which the

immediately successful and some were quite impressed with taking first the dose of alkali and then the not-unpleasant broth culture. Most of the patients who had had dysentery before and had been treated with serum and drastic

TABLE VII
Results of treatment

	Number of deaths	Percentage mortality	Average number of days		
			for temperature to become normal	for stools to become normal	spent in hospital
111 cases treated with bacteriophage	6	5.4	3.5	9	23
120 cases not treated with bacteriophage	13	10.8	3	7.3	17

patient passed the maximum number by the total number of cases in each category.

In table VII the results of treatment, as shown by the criteria of improvement already referred to, are given for the two main groups.

The mortality rate of the cases treated with bacteriophage appears to be half that of the cases not treated in this way and yet convalescence seems to be about 20 per cent. longer. Personally I do not think much more should be deduced from this table than that the results of treatment are approximately the same in each group. I cannot help feeling that even if some of the cases that were not treated with 'phage and died had had bacteriophage a fatal result would still have occurred, and also that really there is not a great deal of difference in the period of convalescence of the two groups. Better figures could of course be made out for either side, perhaps especially for the 'phage cases, by not including patients that had many different methods of treatment tried unsuccessfully on them; there is, however, a danger in thus selecting cases. Actually only 33—or 30 per cent.—of the cases treated with bacteriophage definitely responded to it. In the remainder bacteriophage appeared to have no appreciable effect, but was always tolerated well. Some of the successfully-treated 'phage cases responded dramatically and at once, not only as regards their general condition, but their local as well. In others, although the toxæmia disappeared and the temperature became normal, the diarrhoea and blood and mucus continued for three or four days. As a matter of interest I give the 'recovery' figures for these 33 patients in table VIII.

Very few of my cases were cured with one single dose of bacteriophage in the same way that most of Professor d'Herelle's seem to have been. Most patients were well satisfied with 'phage treatment even when it was not

purging greatly preferred being treated with bacteriophage.

TABLE VIII
Results of treatment in cases that responded to bacteriophage

	Average number of days		
	for temperature to become normal	for stools to become normal	spent in hospital
33 cases treated with bacteriophage.	2.9	6.6	15.3

Conclusions

1. That bacteriophage treatment is still in its early stages.
2. That bacteriophage is well tolerated by patients suffering from bacillary dysentery.
3. That bacteriophage was successful in effecting a speedy cure in 30 per cent. of the cases in which it was used.
4. That in the remaining 70 per cent. it appeared to have very little effect clinically.

Acknowledgements

I should like to thank every one at the Presidency General Hospital, Calcutta, for their co-operation in the treatment of the patients, in the collecting of these case notes and in the preparing of this paper. I am particularly grateful to the ward sisters and house surgeons for their loyal assistance and close co-operation during the whole period that I was working in the hospital.

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THE TESTING OF ANTHELMINTHICS

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THE only worms considered in this paper are the common intestinal nematodes of man. The cure of these helminthic infections is established by the inability of the observer to find in the stools after treatment the characteristic eggs of the species under consideration. A natural corollary of this is that the estimated curative value of any drug is directly dependent on the efficiency of the method employed for detecting eggs. Thus, it is of little value to state that eggs were present before treatment and were absent after it had been given, unless the method of egg detection is a highly efficient one. Because, if the drug being reported upon is at all powerful in the action, it may be anticipated that the number of eggs per cubic centimetre of stool will be greatly reduced, and a series of cases all passing eggs in numbers large enough to be found with certainty by a simple smear before treatment may have the number so reduced by treatment that only a few, or none at all, will exhibit eggs by this crude method afterwards; whereas a better method of demonstrating eggs will show many of these apparent cures to be still passing them, but in much reduced numbers.

With the object of demonstrating how different methods of egg recovery influence the number of positives found, especially when the eggs are few in number, the following tables have been compiled. These figures do not apply to cases that have been subjected to treatment, but are from a number that have been examined in the course of survey work in Bengal and Assam, and they represent the results obtained from the examination of a single preparation of each stool both by Lane's and Stoll's techniques. It will be noted that four species of worm have been included. It has always been

TABLE I

Worm	Number positive to Lane, positive to Stoll	Number positive to Lane, negative to Stoll	Number negative to Lane, positive to Stoll	Average eggs per c.cm. of stool
Ascaris	3395	302	24 and 202 (unfertilized)	7963
Hookworm	(1) 466 (2) 2608	72 892	55 15	908
Trichuris	1798	2163	44	385
Trichostrongylus.	123	416	0	198

found by us in India that these four species habitually average different numbers of eggs per cubic centimetre of stool, when a series is taken together; ascaris average the highest,

followed by hookworm, trichuris and trichostrongylus in descending sequence. Thus, the ascaris and hookworm infections may be taken to represent cases before treatment, and trichuris and trichostrongylus to represent partially-cured cases of the first two infections. In this way these tables supply useful information as to the comparative value of Lane's and Stoll's techniques with varying numbers of eggs in the stools.

The figures under hookworm have been divided into two groups because early in the course of examining a large series of stools it was found that a considerably greater number of stools than usual were being returned negative by Lane's method and positive by Stoll's count, the latter often showing several hundreds of eggs per cubic centimetre of stool. At this time, only a few special cover-glasses for Lane's centrifuge were available so that the same ones had to be used several times a day, and it was then noticed that most of the failures in Lane's technique were occurring towards the end of a day's work. The fault was thus quickly traced to the laboratory attendant responsible for cleaning the apparatus; to prevent delay in preparing a fresh batch of stools for centrifugalization he was scamping his work. Examination of the cover-glasses showed they were greasy and apparently hookworm eggs would not adhere to them; when proper precautions were taken regarding this point the figures in group 2 were obtained. In the case of ascaris and trichuris the effect of greasy cover-glasses was not apparent.

TABLE II

	Per cent. positive to Lane, positive to Stoll	Per cent. positive to Lane, negative to Stoll	Per cent. negative to Lane, positive to Stoll
Ascaris	91.4	8.12	0.64
Hookworm	74.19	25.38	0.43
Trichuris	44.89	54.01	1.10
Trichostrongylus.	22.63	77.37	0.00

Table II consists of the figures in table I reduced to percentages, with the omission of group I in the hookworm series, in which it has been shown that faulty technique was employed, and of the ascaris cases passing unfertilized eggs only, because these eggs never being found by Lane's technique do not come into the question of the comparative values of the two methods. It might be held that on account of the inability of Lane's technique to demonstrate unfertilized ascaris eggs, it is of no use for testing the efficacy of a drug for ascaris infection, but this objection can be easily overcome

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DENGUE FEVER IN THE RANGOON-MINGALADON AREA

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CAPTAIN, I.M.S.

and

JEMADAR BACHAN SINGH, I.M.D.

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DENGUE is endemic in different parts of the world and the Rangoon-Mingaladon area is one of them. Outbreaks of this fever differ from each other in minor details but the outstanding features are the same everywhere. In this article it is intended to describe the type which spreads here every year. Mingaladon, the new cantonment for Rangoon, is situated twelve miles north of Rangoon and the main garrison is stationed here. Small detachments of the Indian as well as of the British regiments are stationed in Rangoon. The sick from these are admitted direct into the British Military Hospital from a detention hospital. The cases in Mingaladon hospital are therefore cases occurring in the Rangoon-Mingaladon area and the information given below has been collected from cases which were admitted during 1930 and 1931.

Prevalence.—The disease is endemic in Rangoon because sporadic cases keep on coming in throughout the year. The number of cases diagnosed as dengue was highest in April in 1931 and in July in 1930. During the month of July in 1931 a large number of cases were diagnosed as mild influenza and it is very probable that a number of them were really dengue. The following figures show the number of cases reported as dengue during the years 1928 to 1931.

1928	..	350
1929	..	73
1930	..	82
1931	..	95

Carrier.—Epidemics of dengue coincide with the increase in the number of *Stegomyia*

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by selecting cases that only show fertilized eggs.

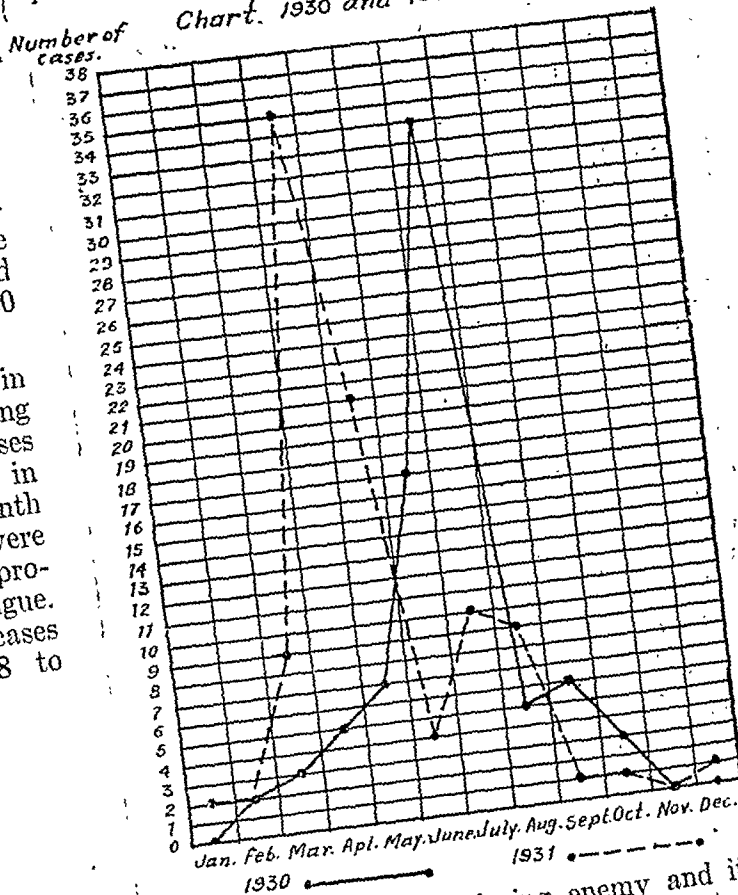
From the above discussion it seems clear that many cases of light helminth infection, such as will be found after treatment by an efficient anthelmintic will be missed by Stoll's technique and discovered by Lane's centrifuge, and that, although Stoll's technique is of undoubted use as a means of diagnosis in cases passing large numbers of eggs, it is not very reliable when the eggs are few, and it may thus give a false impression of the value of an anthelmintic.

mosquitoes, of which the following three varieties are present here:

Aedes aegypti.
Aedes albopictus.
Aedes vitatus.

The first one is the commonest. *Aedes aegypti* can be found in houses in Rangoon practically throughout the year but it becomes particularly common during the rainy season. It breeds in small water collections round about the houses. *Anopheles* and *Culex* mosquitoes remain hidden during the day and come out in search of food only after sunset but the *Stegomyia* mosquito is out for its victims more during the day than at night. For the same reason while one can escape the bite of *Anopheles* by the use of a mosquito net it is

Chart. 1930 and 1931.



difficult to escape this daring enemy and it is a common experience for the residents of Rangoon to find it settling on the exposed parts of the body (hands, neck, etc.) at all hours of the day. The silvery spots on its legs and the lines on its thorax distinguish it straight away from the ordinary *Culex*.

Immunity.—The disease is not very prevalent amongst the permanent residents. This may be due to residual immunity from previous attacks. One thing is certain and that is that any individual who suffers from dengue once does not fall a victim to it soon, or if he does the attack is much milder. One day's fever with slight congestion of the throat is quite a common complaint with the civilian population and it is quite possible that these are mild attacks of this fever. It is also probable then that

quite a large percentage of the permanent residents in this way act as sources of infection to the mosquitoes in the non-infected parts of the town by their movements. There is no racial immunity. Newcomers to the town are more susceptible and this fact was particularly noticed when the present British regiment arrived here in October 1930. A large number of cases occurred during the first epidemic season and the picture of the fever was typical in almost all cases. This was not so when their predecessors were here.

Symptoms.—The fever generally came on suddenly with chill and the temperature went up to 101°F .– 105°F . In some cases the actual attack was preceded by general malaise for a day or so. Most of the patients complained of headache and vague pains all over the body. Pain localised over the eyeballs and back was a special feature of the fever. The severe pains characteristic of 'break-bone fever' were complained of only in a few cases, while 16 per cent. of those admitted to hospital did not complain of any pain at all. Pains when present were mild and did not cause discomfort to patients in their movements in bed.

Rash.—From the very beginning of the attack the patients had a flushed face and injected conjunctivæ. The rash was not noticed till the third day. In some cases it came out as late as the fifth day. It was present in 16 per cent. of British and 5 per cent. of Indian patients. It is quite possible that it was missed in the Indian cases owing to the dark colour of their skin. When present the rash was noticed first on the arms, round the neck, and then on the body. In a couple of hours it was fully out. The rash was not the same in all cases. It was very discrete in some, but covered the whole body in others. In one case only was it present on the palms of the hands and the soles of feet. The rash was measly in type in most cases, but some showed urticarial and scarlatiniform rashes also. The rash started disappearing within 48 hours of its appearance.

Temperature.—This reached the maximum in a day or two and there was a remission on the next day. The remission became marked between the third to fifth day, so much so that one expected the next drop down to normal when on the other hand it shot up again for a day and settled down to normal next day or

at all and the temperature settled down to normal by the morning of the fourth or fifth day.

Different types of fever charts

Chart 1.

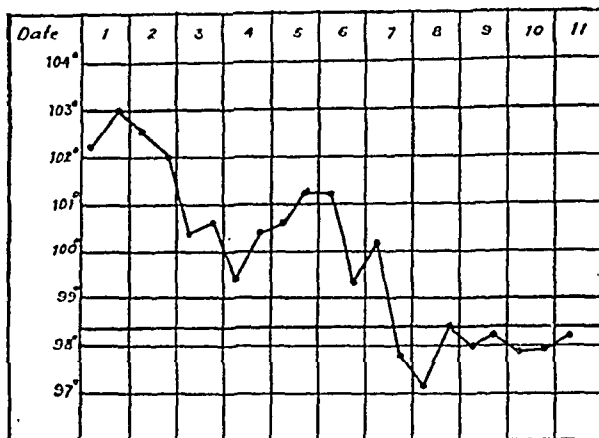
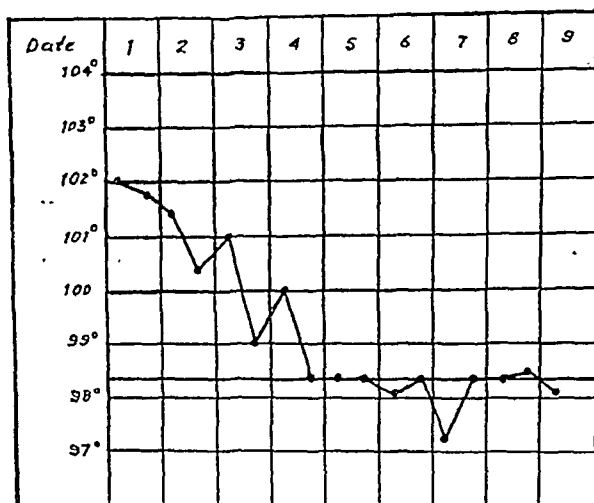


Chart 2.



No case had a continuous type of fever.

Pulse.—It was relatively slow, but the drop to 40 or 50 was not noticed in any case.

Blood examinations.—Out of a total of 177 cases which were admitted during the years 1930 and 1931, fifty with typical symptoms were selected for total and differential leucocyte

Day of disease	Total leucocyte count	DIFFERENTIAL LEUCOCYTE COUNT			
		Polymorpho-nuclears	Lymphocytes	Large mononuclears	Eosinophiles
1st day ..	5,440 per c.mm.	69 per cent.	28 per cent.	2 per cent.	1 per cent.
3rd day ..	3,000 " "	58 " "	36 " "	6 " "	.....
5th day ..	3,190 " "	44 " "	45 " "	19 " "	1 per cent.
7th day ..	6,000 " "	64 " "	32 " "	3 " "	1 " "

the day after. As a rule it was normal by the seventh day. This was the course of the temperature in the majority of the cases. In 25 per cent. of cases there was no secondary rise

counts. The above-tabulated figures give the average count on different days.

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THE RÔLE OF SEROLOGY IN RABIES

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D.P.H. (Liverpool)

MAJOR, I.M.S.

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THE methods employed in testing the immunising agents in use in the prophylactic treatment of rabies are particularly tedious, troublesome and expensive. The results obtained after long delays are as often as not indefinite and unrepeatable. The infecting doses do not admit of accurate measurements. The routes of infection are either too direct or too remote to be uniformly useful. The period of observation extends over six months.

In 1928, at the Pasteur Institute of Burma, Rangoon, the writer made attempts at employing the complement fixation reaction for detecting evidence of immunity in immunised animals and in treated cases. The doses of the vaccine then used were small and the only animal used in the experiment was the rabbit. The reactions were poor, inconstant and on the whole unconvincing.

With the increase in the dose of the vaccine now generally employed for serious cases in most of the antirabic clinics in India and with the advent of the sheep into the experimental field the reactions have become strong, constant and measurable.

The writer has now employed for the last six months a definite technique of complement fixation which will be published in detail in the *Indian Journal of Medical Research*.

(Continued from previous page)

The lowest count on the third day was 2,200 per c.mm. and the highest 3,800 per c.mm. In only one case was eosinophilia noticed, on the tenth day of the disease.

Bowels.—Usually constipated.

Spleen.—Not enlarged.

Conclusions

1. The fever has a seasonal prevalence every year (April to September).
2. *Aedes aegypti* is most probably the vector.
3. Newcomers to the area are more susceptible, and the picture of the fever is very typical in them.
4. The blood picture is characteristic of this group. The total leucocyte count is more or less normal with the onset of fever and then very rapidly goes down till the minimum is reached on the third day. It starts going up again till it is about normal on the seventh day.
5. The rash is not present in all cases.
6. Severe pains are not an important feature.

We have to thank Lieut.-Colonel G. G. Tabuteau, D.S.O., V.H.S., R.A.M.C., Commanding the Combined Military Hospital, Mingaladon, for his encouragement and permission to work on the cases.

Briefly, it is based on the ordinary British methods of performing a Wassermann test, specially on the method no. IV of the Medical Research Council (*The Wassermann Test*, 1920).

The antigen used is the deposit-free fluid from the ordinary 5 per cent. Paris-virus sheep-brain carbolised vaccine of the Pasteur Institute, Kasauli, made thus: The brain of a sheep is made into an 8 per cent. suspension with 1 per cent. carbolic acid in normal saline; this is incubated for 24 hours at 37°C. and then diluted to a 5 per cent. suspension with normal saline; this is kept at room temperature for about 30 days before use. The fluid can be removed by decantation, as a supernatant fluid from a resting ampoule, by filtration through filter paper or by centrifugalisation. Its degree of opacity varies. Its anti-complementary power is the same and so is the power of fixation. It is used in the same way and in the same proportion as the antigen in the Wassermann reaction in method no. IV. The vaccine used is over 3 months old. The writer prefers this antigen for considerations of simplicity and safety alone to the antigen described by Marie and Urbain (1929).

The first incubation (after mixing together the serum, the complement and the antigen) takes one hour at room temperature, 45 minutes at 37°C. in a water bath, and 15 minutes at room temperature again. The final incubation (after adding the red-cell suspension) takes half an hour. The following is an ensemble for sheep serum:—

The ensemble

To suit specially a small volume procedure, plasticine stand, small quill tubes with stirrers, pipettes with tents and a water bath with glass sides: After descriptions by Hewlett (1926) and Brown (1915).

Left at room temperature for 1 hour.

Left in water bath at 37°C. for 45 minutes.

Left at room temperature again for 15 minutes.

Sensitised red-cell suspension, 1 vol., added to all the tubes.

Left in water bath for $\frac{1}{2}$ hour.

Lysis and inhibition of lysis noted.

Left in the cold overnight.

Traces of lysis noted.

M. H. D.'s of the complement in the fully-lysed serum control *plus* the M. H. D.'s in the fully-lysed antigen control *minus* 1 (only the anti-complementary titres of the serum and the antigen have been added together; the volume of the red-cell suspension has not been doubled) *equals* the M. H. D.'s needed for a complete lysis when the serum and the antigen are put together. Any amount needed for an incipient lysis above this figure *plus* 1 represents the complement fixation measured in M. H. D.'s.

For human serum a similar technique, with smaller doses of complement, is on trial. To exclude a non-rabic reaction a 'blank' antigen made from the brain of a normal sheep is used as an extra control. The results so far have not been conclusive. Modifications are possible.

The sheep serum, obtained from sheep immunised against dead Paris fixed virus, is tested to determine its potency before use in the experiments in immunisation, on animals, which are being performed at Kasauli. There is a serum now available which fixes 10 M. H. D.'s of complement. The titre has been raised by using the intravenous route for immunisation. It was found that by using the intravenous route a serum of higher titre was produced in 2 months than could be produced by using the subcutaneous route in 8 months. Further, the nature of the reaction suggests that a still higher titre is possible, the inhibition of lysis not terminating abruptly but gradually and 'irregularly'. The serum is inactivated for 10 minutes at 55°C.

disengage toxins from the cells by means of phylaxis induced by chloroform and to ensure absorption from the theca by a reversal of the circulation of the cerebrospinal fluid brought about by giving hypertonic saline intravenously. King (1932) in a recent communication has subscribed to this view.

2. *Could an antirabic serum be used as a prophylactic agent in one or two doses in the place of the vaccine which must be given in a large number of injections and the administration of which apart from the associated discomfort and inconvenience is not altogether free from risk?*

A comparison with tetanus again makes such a hope justifiable. The two diseases are so

Reagents	SERUM CONTROL		ANTIGEN CONTROL		TEST PROPER		
	Tubes:—		Tubes:—		Tubes:—		
	1st	2nd	1st	2nd	1st	2nd	3rd
Complement, M. H. D's, in 1 vol.	2	3	2	3	8	10	12
Serum, 1 in 5 ..		1 vol.		Nil.		1 vol.	
Antigen ..		Nil.		1 vol.		1 vol.	
Saline ..		1 vol.		1 vol.		Nil.	

The purpose of testing the human serum, obtained from patients who have undergone prophylactic treatment for serious bites, is to ascertain whether antibodies against fixed virus have made their appearance. The serum is left at room temperature for 24 hours before use. It is not inactivated at 55°C.

The problems awaiting elucidation may now be taken up serially:—

1. *Could an antirabic serum ever be used as curative agent?*

Sera from hyperimmunised animals have definitely been proved to be possessed of rabidicidal power *in vitro*. Semple (1903, 1904 and 1911) in this institute made observations on the subject. He worked with the fixed virus. Similar results have been obtained recently with street virus. They will be published in the annual report of the institute in due course.

Sera from the patients who had undergone a course of antirabic treatment at Kasauli were tested by Lamb and McKendrick (1909). They failed to demonstrate the presence of rabidicidal action in any of the sera.

Apart from the animal test we do not know how potent Semple's sera were. A more potent serum can be obtained by improved immunological, physical or chemical methods. The difference in action *in vitro* and *in vivo* is perhaps mainly due to a difference in concentration only.

Given the proper concentration, then, we could treat a declared case of hydrophobia with the same degree of success as a declared case of tetanus, especially in the light of the recent advances in neurology which make it possible to

much alike that a similar line of action is not only possible but desirable.

3. *Could an antirabic serum be used as an adjunct to the ordinary vaccine treatment given as a prophylactic?*

Sero-vaccine therapy is already in use in some clinics in Europe. Perhaps a bigger dose of the serum could be used to serve two purposes: (i) in dangerous bites to prolong the incubation period by inducing a passive immunity and to give the active immunity time to assert itself before the symptoms are due to develop, and (ii) to avert a negative phase which possibly occurs during the treatment and is responsible for a certain number of patients out of a certain class of cases developing hydrophobia during treatment earlier and succumbing to it quicker than would have been the case had no treatment been given at all.

4. *In serious cases could the ordinary process of immunisation be controlled by performing a complement-fixation reaction at some suitable stage of treatment?*

This is a feasible proposition. The test may establish a correlation between the strength of the serological reactions of the patients' sera and the failures of treatment.

Later, if so indicated by the test, a more intensive form of treatment, including an intravenous administration of a finely-divided vaccine could be instituted for certain cases. The vaccine has been administered intravenously by Morison (1924) without any ill effects.

5. *Could the vaccine itself be improved by using selected 'strains' in its preparation or by*

discarding an inert part of it and increasing the dose?

The antigenic value of the virus from various sources (? strains) could be tested against a constant antirabic serum and the results confirmed by a protection experiment. The International Rabies Conference of Paris of 1927 [League of Nations publications, C. H. 531 (I)], 'recommends that enquiries be made into the plurality of strains of street and fixed virus and into the rabicidal action of the serum of man and animals during and after immunisation'. The usual process would take months. The observations on the effect of treatment on the patients would take years.

As observed in the complement-fixation reaction, the antigenic part of a three-months-old vaccine is the deposit-free fluid only. In an actual protection experiment, however, Taylor and Menon (1930) have shown that 'removal of brain substance from the vaccine by filtration greatly reduces its immunising value'. Further work with a vaccine at different ages may help. The filtrate from a fresh vaccine (under a week old) has very poor power of fixing complement.

6. *Need a vaccine over three months old be discarded?*

Gloster and Taylor (1926) have observed that in one of their experiments a 3½-months-old vaccine appeared to have afforded less protection than a fresh vaccine. Results of a complement fixation reaction are diametrically opposed to this observation. More work on this question would be justified.

7. *At least in animals, especially in dogs, would a street virus (first passage) rendered inert with an antirabic serum induce better immunity than the fixed virus?*

Experiments in this connection are in progress. So far no dogs have died from rabies as a result of the protective inoculation. Five c.cms. of a 10 per cent. suspension of a first-passage street-virus brain mixed with an equal quantity of an antirabic serum and allowed to stand at room temperature for 24 hours were given, as a single dose, subcutaneously into the abdominal wall, 3 months ago. The animals will be given the test dose 6 months after the inoculation.

8. *Are serological methods, speaking generally, reliable in estimating immunity?*

A little while ago it apparently became a fashion to dissociate serological reactions from actual immunity. The position to-day is one of reconsideration of facts.

With regard to the active immunity induced in an individual, according to Topley and Wilson (1929) 'there is no doubt at all, from the general experience of immunological workers, that the correlation between active immunisation and the appearance of sensitising antibodies in the blood is a high one'.

With regard to the correlation between the antibody titre of a particular sample of serum, as measured by serological methods, and its power to protect *in vivo*, the situation is different. The correlation, if any, must be proved by an actual protection experiment. The serological technique, however, will aid tremendously, saving time, space and money. Once some correlation is established (as is the case with the antirabic serum, with regard to the neutralisation of the virus *in vitro*, as proved by an actual protection experiment) attempts at raising the titre should be made and the power to protect should be tested at reasonable intervals. A difference in action *in vitro* and *in vivo* may only be due to a difference in the concentration attained.

Summary

1. The advantages of utilizing serological reactions in antirabic work are pointed out.
2. A technique for a complement fixation reaction in rabies is briefly described.
3. Possibilities of improvements in the treatment of rabies are discussed.

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A Mirror of Hospital Practice

A CASE OF CONGENITAL SINGLE KIDNEY WITH DILATED URETER

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A HINDU male, aged 17 years, came to us for an investigation regarding his albuminuria.

Past history.—Four years ago the patient had an acute attack of pain with redness and inflammation of the metatarso-phalangeal articulation of the big toe of the left foot; this was diagnosed as gout. He had two more similar attacks which affected the metatarso-phalangeal articulations of both the feet. During the last attack the urine of the patient was examined and albumin was detected. The albumin in the urine increased from 0.04 per cent. to 0.14 per cent. even when the patient was put on milk diet and rest, but later it came down to 0.037 per cent. It should be noted here that no casts or other abnormalities were detected. The albuminuria was persistent.

Physical examination

General appearance.—The general appearance of the patient suggested that he was in good health except that there was a rather unusual pallor of the face. There was no history of loss of weight and strength; the bowels were regular. The only symptom that the patient complained of was occasional thirst. The total quantity of urine passed in 24 hours varied within normal limits.

Examination.—Except for some pyorrhœa alveolaris and slight increase in blood pressure, nothing abnormal could be detected. The systolic blood pressure was 138 mm. of mercury and the diastolic, 108.

The following biochemical investigations were carried out:—

Blood—

Non-protein nitrogen	..	0.058 per cent.
Blood urea	..	0.030 per cent.

Urea concentration test before and after ingestion of 15 grains of urea.

	Quantity passed	Specific gravity	Percentage of urea
Before ..	190 c.cm.	1006	Below 0.5
One hour after ingestion of urea.	135 c.cm.	1008	Below 0.5
Two hours after	127 c.cm.	1005	0.55
Three hours after	90 c.cm.	1005	0.55

A thorough examination of the renal function of the patient brought out the following points:—

1. The specific gravity of the urine was found to be persistently low and was unaffected by food and exercise.

2. The albumin-globulin ratio was 7:1 and was unaffected by rest or exercise.

3. The total quantity of urine passed in 24 hours was normal. Urine passed during the day and urine passed during the night showed no difference as regards quantity, specific gravity, protein content, etc.

4. The power of the kidneys to concentrate urea after ingestion was found to be very poor.

5. The concentration of non-protein nitrogen and urea in the blood were very high.

An x-ray examination of the urinary tract and skiagrams taken after injection of uroselectan showed very unusual features (see figures 1 and 2). It was found that the patient had a congenital absence of the right kidney, only the left kidney being present. The ureter was enormously dilated and there was a constriction in it near its bladder end (figure 2). The bladder was contracted. The excretion of the uroselectan was poor, giving additional evidence that the kidney function was defective. No evidence of calculus was found.

The patient was examined by Dr. L. M. Banerji who found that the kidney was not greatly enlarged laterally or antero-posteriorly.

Discussion.—The possibility of the proteinuria being the simple albuminuria of adolescents may be excluded by the following facts:—

(a) Rest or exercise makes little difference in the constituents of the urine, especially albumin.

Urine	24 HOURS' SPECIMENS		Day urine	Night urine	Urine passed during rest	Urine passed after exercise
	Sample 1	Sample 2				
Specific gravity	1006	1008	1008	1006	1006	1006
Quantity	..	..	900 c.cm.	840 c.cm.	..	..
Total protein, per cent.	0.11	0.08	0.1	0.12	0.12	0.13
Albumin-globulin ratio	..	7.1	..	..	7.1	7.1
Urea, per cent.	Below 0.5	..	Below 0.5	Below 0.5	Below 0.5	Below 0.5
Chlorides, per cent.	0.36	..	0.27	0.36	..	..
Diastase	6.6 units	..	..	..	..	..
Casts	Nil	..	Nil	Nil	..	..

(b) The blood pressure is slightly but definitely above normal.

(c) The albumin-globulin ratio is 7:1.

The possibility of the case being one of hydro-nephrosis is also excluded by the following facts :—

(a) The twelve-hourly collections of urine, collected separately during day and night, show no difference as regards quantity, specific gravity, protein content, etc.

(b) The total quantity of urine passed in 24 hours is not excessive.

(c) There is no history of passing large quantities of urine periodically.

Conclusions

It is evident from the results of the tests done that the existing kidney is definitely functionally defective. The specific gravity of the urine is persistently low and is unaffected by food or exercise. The urea concentration test gives very low results showing definitely that the kidney is markedly defective as regards its power of concentrating as well as excreting urea and other colloids. There is retention of both non-protein nitrogen and urea in the blood. The poor excretion of diastase in the urine also lends an additional support to this view. Though the presence of casts, especially the presence of epithelial casts in moderately large numbers, would have lent further support to the suggestion that the kidney is diseased, their absence from the urine does not in our opinion disprove the conclusion arrived at by us. Experience has shown that casts may be few or absent even in grave renal lesions.

A FATAL CASE OF SEVERE MALIGNANT TERTIAN MALARIA

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and

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M. R., a Hindu male, aged 45 years, was admitted into the Carmichael Hospital for Tropical Diseases on 12th July, 1932, with fever. As the patient came in in the afternoon he was seen by the house physician. He had a temperature of 102°F. and looked very ill.

Past history.—The patient had been having fever off and on since June 1931. He was admitted into the Carmichael Hospital for Tropical Diseases on 26th September, 1931, when benign tertian rings and scanty gametocytes were found in his blood; the spleen and liver were palpable. He was treated with quinine and was discharged from the hospital clinically cured on 8th October, 1931.

Condition on admission.—12th July. Examination of blood showed a very large number of malignant tertian rings and scanty benign tertian

tropozoites. One tablet of atebirin (0.1 gm.) was administered soon after admission, another a few hours later.

13th July.—The patient was examined in the morning by one of us (R. N. C.). He looked very ill and drowsy; an immediate examination of blood and a malarial parasite count was made.

1 P.M. The parasite count was 1,260,000 per c.mm., young rings and scanty schizonts being present. 7½ grains of quinine intravenously was ordered, but only 5 grains could be given as the patient's pulse became very weak, although the injection was given very slowly. Examination of blood every three hours was carried out.

4-50 P.M. The infection was so heavy that it was not possible to do the counts by Sinton's method of the enumeration of parasites against the avian corpuscles. For this reason the percentage of the red blood corpuscles infected and the total red cells per c.mm. were estimated. The latter were 4,680,000 per c.mm., and as 54.2 per cent. of the cells showed the infection the total number of parasites per c.mm. amounted to 2,527,000, i.e., twice the number present before the administration of quinine.

5-30 P.M. A second injection of 8 grains of quinine was given.

8-25 P.M. 67.4 per cent. of the red cells were found infected, out of a total of 4,180,000 per c.mm., counting only one parasite per infected cell, the total number of parasites was estimated at 2,800,600 per c.mm., but, as a multiple infection was the rule—some cells containing as many as 4 or 5 parasites—the actual number of parasites was much more than the above figure. The phagocytosis of parasites, chiefly schizonts by large mononuclears and polymorphonuclears was noticed.

10-30 P.M. The patient became comatose and died.

Blood taken half an hour before death showed a heavy phagocytosis of the parasites. This phenomenon, though often seen in the blood of the *M. rhesus* with a very heavy plasmodial infection—especially after the administration of quinine (unpublished observations by Knowles and Das Gupta)—and in the blood smear from internal organs of birds infected with proteosoma following administration of quinine, has not apparently been seen by any previous workers, except Knowles and Das Gupta (1931) who only once encountered scanty phagocytosis in a case of infection with *P. falciparum*.

Thomson and Robertson (1929) give the figure of a polymorphonuclear leucocyte containing two mature schizonts of *P. falciparum*. They do not mention whether the material was derived from peripheral blood, spleen juice or culture.

Remarks

1. When the infection is very heavy, as in the case referred to, no antimalarial remedy, by whatever route it may be given, appears to be of any avail. The same thing is observed in monkey malaria in which quinine almost always fails when the blood of a *M. rhesus* is heavily parasitized, that is, when the infected cells are 50 per cent. or over. The first effect of administration of quinine is often a definite increase in the number of parasites in the blood.

2. The heavy phagocytosis of parasites by the polymorphonuclear and large hyaline

A CASE OF CONGENITAL SINGLE
KIDNEY WITH DILATED URETER

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Fig. 1.—Skiagram of the kidney region 50 minutes after administration of uro-selectan. Note absence of the kidney on the right side and tremendous dilatation of the ureter emerging from the left kidney.



Fig. 2.—Note the dilated ureter in the left half of the pelvis with a kink at the bladder end.

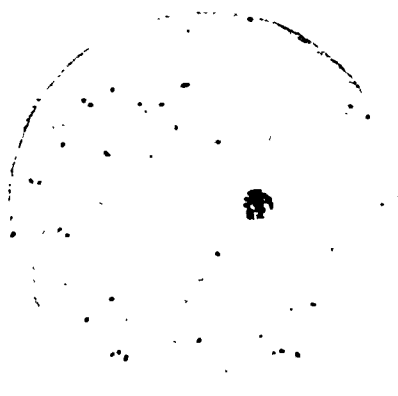


Fig. 1.—Smear taken at 1 p.m. just before the administration of quinine showing numerous rings and one schizont in the field.



Fig. 2.—Smear taken at 8 p.m., 7 and 3 hours after the 1st and 2nd dose respectively of intravenous quinine, showing a very heavy infection, multiple infection of cells and phagocytosis.

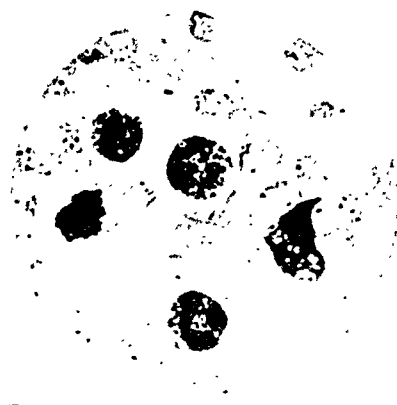


Fig. 3.—Smear half an hour before death showing the heavy phagocytosis of the parasites by the large hyalines and polymorphonuclear leucocytes.

leucocytes, a very uncommon appearance, was a remarkable feature of the blood film taken half an hour before the death of the patient.

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A CASE OF LARGE PEDUNCULATED LIPOMA OF THE GLUTEAL REGION.

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A MALE, aged 35 years, was admitted to the hospital for a large tumour of the left gluteal region. It had been present for ten years gradually increasing to the present size. The



Right side view.

tumour was pedunculated, bi-lobed and was hanging from the left gluteal region (*vide* illustration). The skin over the tumour was ulcerated in places following the application of irritants.

The growth was quite painless but caused great inconvenience by its bulk and weight.

The tumour was removed under local anæsthesia. The pedicle contained a number of large veins and some arteries. The tumour weighed 16 pounds and was found to be a lipoma with no secondary changes. The pedunculated nature, the large size, the weight, and the bi-lobed character of the lipoma are interesting features.

GENERALISED EPILEPSY CAUSED BY A DURAL CYST

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THAT focal fits could be caused by lesions in the brain was first pointed out by Hughlings Jackson and ever since then Jacksonian epilepsy has come to be recognized as a type where focal lesions in the brain caused a focal discharge, which exteriorised in the form of a twitch, starting at a particular part or limb, gradually extended, and became a well-defined convulsion. This was often confined to a particular limb or to one side of the body. The gradual march of the spasm, as the discharge spread through neighbouring regions of the brain, was looked upon as characteristic. There was no loss of consciousness, and after the attack a residual paralysis was another feature indicating the location of the lesion. Afterwards it was recognized that such local fits could occur without any noticeable lesions, as a part of 'idiopathic' epilepsy. Still later, it was found that fits due to lesions of the brain might take the form of generalised convulsions without any localising features. The discharge spread rapidly through the whole cortex and generalised convulsions resulted. In such cases, loss of consciousness may occur because of the wide area of the cortex involved.

The following case of dural cyst is of great interest since it caused generalised epilepsy showing all the features of idiopathic epilepsy.

C. R., a labourer, aged 45, was admitted to the surgical wards of the Government Royapuram Hospital under the care of one of us (V. M.) for a lacerated wound of the left eyebrow due to a fall. The patient was subject to epileptic fits, had fallen down from the verandah of a house in a fit, and had cut his forehead just over the left eyebrow. During examination it was noticed that there was a depression over the opposite eyebrow with scar, where the frontal bone appeared to be driven in. On a careful analysis of the history it was found that 25 years ago, when the patient was wrestling with other boys of his own age, he had a fall and had hit his forehead against a stone, which had resulted in the depression noticed. There was a wound on the skin and severe bleeding at that time. After the fall he was unconscious for some time, he had gradually recovered and the wound had healed up without any further trouble, but the depression had remained. Some years after the fall the patient started getting fits accompanied by loss of consciousness. There was some unsteadiness in the gait, the patient being unable to walk in a straight line. A careful inquiry into the history showed that the only sign of any localising value was the occasional occurrence of a sudden mist before the right eye while the patient was walking, so that he suddenly staggered. The fits occurred by night and by day, and were always accompanied by loss of consciousness. Incontinence during the fit was unusual,

The tongue was not bitten. The fit itself was generalised like idiopathic epilepsy, but there was no well-defined aura and the patient could never anticipate the fit. Oftentimes he fell and hurt himself. The unconsciousness was profound and it was some time later that the patient recovered. Examination of the fundus showed that the right disc was more swollen than the left. The visual fields were normal and the vision was normal. There was nothing noticeable in the nervous system except that there was a doubtful extensor plantar response on the left side and that the left epigastric reflex was more sluggish than the right. There were no signs of oculomotor paralysis, and no signs of any involvement of the cranial nerves. In the history itself there was nothing else to indicate a cerebral lesion such as headache or vomiting. The mental condition was rather irritable and cerebration was slow, the patient taking time to answer questions. His memory for past events was not good. There was no tremor of any kind, but there was a tendency to reel towards the left side, the patient holding himself with his body slanting towards the left so that there was a slight scoliosis. The left foot was often crossed and placed in front of the right. The pupils were medium and reacted to light and accommodation.

The general nutrition was good, the heart and lungs showed no abnormality. There was no enlargement of the liver, spleen, or lymphatic glands. The alimentary functions were normal. There were seborrhœic patches on the face and forehead. The blood pressure was 98/55.

As there were definite signs of involvement of the pyramidal tract it was decided to operate and raise the depressed bone. On trephining it was found that there had been a depressed fracture at the site of the old injury, about half an inch above the outer half of the right eyebrow. A dural cyst about the size of a lime had formed at the site of fracture and had caused pressure on the frontal lobe just in front of the precentral gyrus. The cyst contained thin brownish fluid, apparently altered blood. The wall was thick and was formed by the dura. There was a cicatrix on the outer side corresponding to the site of the depression on the inner table. This fracture had apparently caused a small tear in the dura, and this was followed by hæmorrhage which had limited itself and resulted in the formation of a defining cyst wall. This had caused some pressure on the corresponding region of the frontal lobe and had exteriorised in the form of fits. The doubtful extensor response on the left side and the diminution of the epigastric reflex would be due to the slight involvement of the precentral gyrus.

The operation was carried out on 31st July, 1932 and since then the patient has had no fits. An examination after operation showed that the signs of pyramidal involvement were still present, but the fundus was normal. The gait was unaltered the left foot being crossed over and placed in front of the right when walking. The mental condition was still the same.

The importance of this case is to demonstrate that generalised epilepsy may sometimes be due to well-defined organic lesions which call for surgical treatment.

A NOTE ON TREATMENT OF LIVER ABCESS BY ASPIRATION

By S. L. BHANDARI, M.B., B.S.

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B. S., a Sikh male, aged 35, was admitted to hospital for swelling at the site of the liver for the last 22 days. There was a history of pain in the region of the liver for one month prior to onset of swelling. He had had several attacks of malaria but no dysentery. On admission the swelling was 6 inches by 6 inches by 2 inches—it was reddish blue in colour and tender. Fluctuation could be elicited at the most prominent part, which was over the left lobe. Temperature was normal.

Treatment.—Under local anæsthesia and strict aseptic conditions a small incision was made at the most prominent part of the swelling, and about a pint of deep-chocolate-coloured sterile pus was removed by Potain's aspirator. Pus came out freely, and the needle went in 3 inches or 4 inches, and could be easily moved within the cavity without the slightest obstruction. The needle was then withdrawn and the wound stitched up. Ten grains of quinine sulphate in 10 c.cm. of sterile water were injected into the cavity before removing the needle. Emetine, grain 1, daily was given hypodermically up to 12 injections. The operation was done on 4th March, 1932. The patient had a slight rise of temperature, 99.5°F. on 8th March, and felt pain in the region until 12th March. The stitch was removed on the 14th March, the wound having healed by first intention. The patient was discharged cured on 14th March after complete and uneventful recovery.

A CASE OF CLINICAL MALARIA WITH HERPES OF THE NOSE

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Mr. E., European, 50 years old, reported sick with fever on 4th August, 1932. The history was that the fever started on the previous day with rigors, vomiting, headache, backache and a burning sensation in the eyes. After a few hours the patient began to sweat and the temperature to subside. When he was first seen his temperature was 99.2°F., and pulse 82 per minute. Beyond a little weakness, slight headache and impaired appetite, the patient did not complain of anything and was even ready to go on duty. He was not allowed to do so but was asked to remain in bed. As the patient had taken quinine, the blood was not examined for malarial parasites. The case was diagnosed as malaria and the usual treatment was adopted, viz:—

Mistura quinini hydrochloridi (grs. x to the ounce) three times daily. On the following morning he was given 2 ounces of a saline purgative.

The temperature remained above normal with slight variations till the 6th morning, when it came down to normal after profuse sweating. On the evening of the 5th August a few blisters were seen on the lower lip. By next morning these had extended to the upper lip and whole of the nose. The nose and lips were red and slightly inflamed, and they were dusted over with a little talcum powder morning and evening. On the 10th August the eruption began to subside and completely disappeared in about a week's time.

The only reason for reporting this case is the appearance of herpes of the nose, which seems to be a rare condition in malaria.

I am extremely thankful to Dr. Spreadbury, A.C.M.O., for encouraging me, and to Dr. Hughes, C.M.O., Burma Corporation Ltd., Namtu, for kindly permitting me to send these notes for publication.

Special Articles

NOTES ON A BRIEF TOUR IN MALAYA

By R. SENIOR WHITE, F.R.S.E.

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DURING May and June of this year I was able to pay a short visit to Malaya, to see some of the anti-malaria work in that classical land of practical malariology. Brought up, so to speak, on Watson's 'Prevention', my tour was planned with a view to seeing as much as time permitted of those aspects of the subject treated of in that indispensable work. The localities visited were Penang, Port Swettenham, Kuala Lumpur, Singapore and the estates area around Klang.

The first thing that strikes a visitor from India is that Malaya is not, in our sense, an inhabited country. Population, prior to the opening of the country in rubber, appears to have consisted of small colonies of Malays—themselves immigrants within the last two centuries from Sumatra—confined to the coasts and the banks of the great rivers, living in pile-built villages—a strictly riparian or littoral race.

The interior of the country was everywhere almost impenetrable forest, in which a few thousand Sakai and Semang Negrito dwarfs roamed in an absolutely primitive state of culture. Later, came the Chinese in search of tin, and doubtless were the first race really to suffer from the malarial potentialities of the country. Lastly (within last 30 years) came the white man, planting rubber and coconuts, when the disease immediately assumed the foremost place in the economy of the country.

But for all these efforts, the amount of the country that is 'opened' is relatively small. Commercial effort has been almost entirely confined to the western side of the main range that is the backbone of the peninsula, yet even in this portion one has only to examine a district map to realise how immense are the areas under reserved forest as compared with those under cultivation. Large areas remain to this day practically unexplored.

One's impression, therefore, is of a country where almost the entire population is immigrant and engaged in commercial pursuits. The village and its population deriving a livelihood from their own fields, that virtually is India, hardly exists. The Malay, in his own country, appears distinctly a *rara avis*. Two pile-built villages of fisher folk near Port Swettenham and Johore Bharu, a few garden owners (mixed rubber, coffee and palms) on the coast road near Penang, and in the Kuala Langat district, were all the Malays, other than those in service, that I saw in a fortnight. None of these folk had rice fields, and, though there is some rice grown in the country, I actually saw none.

Burma and Siam appear to feed Malaya almost entirely, though the northern state of Kedah, on the Siam frontier, is also an exporter of rice.

It is at once obvious, therefore, that the economic aspects of malaria in such a country are entirely different from those obtaining in India. I have more than once listened to discussions on whether Malayan methods of control are applicable to the villager, whether in fact, anything has been done for the villages at all. Actually, the question does not arise. The Malay takes no part in the development of the country, and in his own villages is largely out of the malaria zones. For all this, it appears that the Malay has some degree of adult immunity, for I was instanced an epidemic in Penang at the end of a six months' drought, with a very great decrease in breeding, when the Malays were feeling the dry heat intensely, and thus had their resistance lowered.

As regards the aboriginals, Sakai and Semang, almost nothing is known about them. They have been the subject of a certain amount of anthropological investigation. They have a special government officer to watch their interests, but large parts of the country are never visited by any one.

They are slowly beginning to lose their Nomadic habits, and commencing to make contact with other races. In the past this contact has been confined to barter with one man in the nearest Malay village, who alone represented the outside world to them. Dr. Green of the Institute for Medical Research has commenced work on their physical condition, but to what extent they suffer from malaria is entirely unknown. The dense jungles in which they roam are not the home of any of the carrier species of the country. On the opened coastal plains the Sea-Sakai (Sakai-Laut) have 'reserves' from the depths of which they seldom emerge. Here they must be subject to carrier-species attack, however, but its effect on them is uninvestigated.

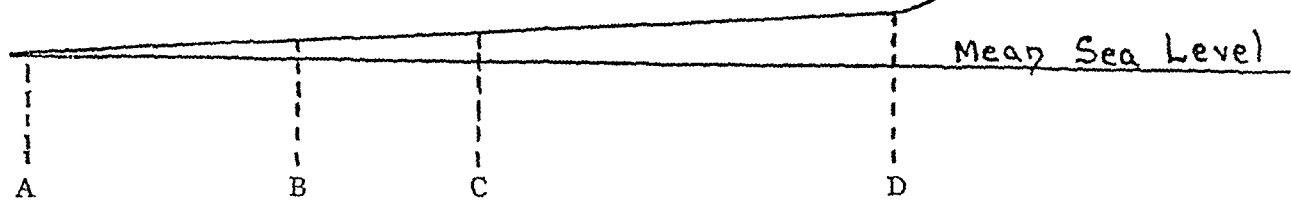
The malaria problem of Malaya, then, is, and always has been from the days when Watson first tackled it, the problem of industrial and urban malaria, problems for the solution of which there is invariably a greater financial latitude than can ever be available for countless scattered villages; this makes any attempt to subject Malayan methods to criticism based on an Indian view-point futile.

Turning now to the problem of carrier species. In spite of all his reading the visitor from India again and again experiences a sense of astonishment at the absolutely defined and limited range these have. There are only three carriers of any importance, *A. maculatus*, *A. umbrosus* and *A. ludlowi*; the limits between their ranges are virtually mathematical lines. The diagram on the next page expresses this in the simplest possible form.

From A to B is the zone daily covered by the tides, which in the Straits of Malacca have a normal range of about 13 feet, extending up to 19 feet at the spring tides.

From B to C is the region only swept by the spring tides, i.e., twice a month, leaving relict salt pools that are rapidly freshened by the almost daily rain.

ludlowi zone is confined to the area between neap and spring tide levels. Owing to the very



Under natural conditions A to C is covered with a growth of mangrove (Fig. 1) of the densest possible consistency. Left thus, there is no anopheline life in it, but if it is cut down, wholly, or enough to admit light, it becomes

flat nature of the coastal plain, this area is in many places over a mile wide. Beyond the point marked by the highest tides, the coastal jungle belt begins. The density of this jungle must be seen to be understood (Figs. 3 and 4).

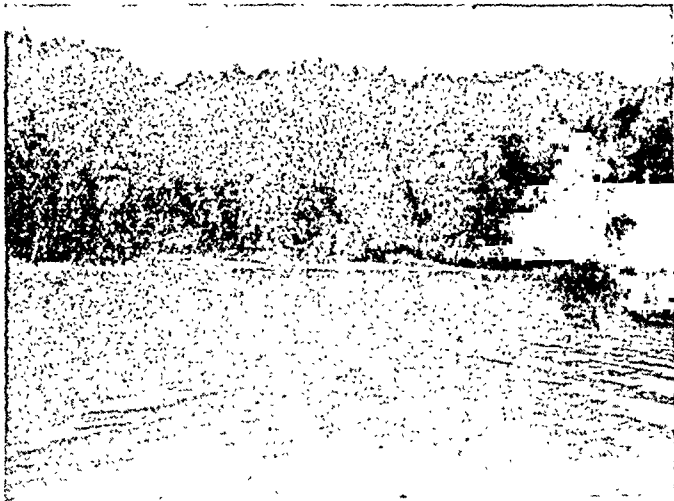


Fig. 1.—Virgin Mangrove, Langat River, above Port Swettenham. Photo taken about half tide.

potentially the *ludlowi* zone. The portion A-B, being swept twice daily by the tide, is in any case harmless (Fig. 2); thus actually the



Fig. 2.—Mangrove outside the bund, Port Swettenham. With light thus admitted this would be dangerous if it were not tide swept daily.

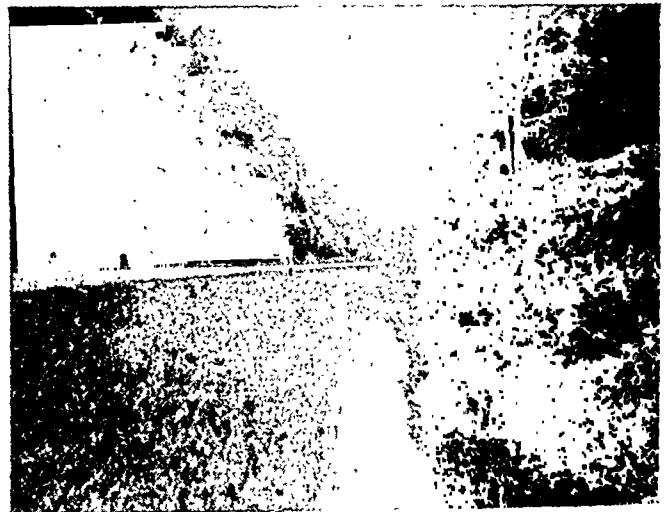


Fig. 3.—*A. umbrosus* jungle, Kuala Langat district.



Fig. 4.—The jungle face, at the boundary of a rubber estate. Peat swamp water beneath the trees. *A. umbrosus*.

Great trees which one can hardly span with both arms are so interlocked that their trunks score one another like creepers. Beneath is

some 2 feet of swamp, the water of which is absolutely clear and of the deepest brown. The depth of shade is such that a newspaper cannot be read at midday. With Sakai cutting a tunnel with their *parang* knives, one can well believe the assertion that a mile a day is good progress through it. This zone C-D is the home of *umbrosus*, and is a formation the like of which does not exist anywhere in India.

At point D the base of the hills is reached. The hill may be no more than a rocky outcrop under 100 feet high isolated in the coastal plain, or it may be the true edge of the foothills—from the malaria aspect the point is immaterial. The forest becomes dry under foot, the dark brown swamp changes to streams and a clear seepage line.

If this zone is left alone it is harmless. It is almost, if not quite, as dark as the one below it. But let in sunlight, and it becomes the *maculatus* zone, and in Malaya it extends as malarionogenic up to at least 5,000 feet elevation.

It will then be understood how it is that the limits of these zones are absolutely fixed, but still the transitions are astonishingly sharp. Dr. Barrowman one day was motoring me to Seafeld Estate. We crossed some controlled *umbrosus* land, the peaty water flowing in the drains. Ahead of us the road rose and the car was stopped at the very bottom of the slope. A dark brown drain here crossed the road. Into it flowed two roadside drains; in it the water seepage was crystal clear—the *maculatus-umbrosus* line, not a foot wide!

The only exceptions to the universal sharpness of these limits occurs at points C and D. With a succession of low spring tides the *ludlowi* zone may be invaded for a short distance by *umbrosus*. If the clear hill-foot seepage is densely shaded, *umbrosus* will invade the clear water, though *maculatus* will not enter the peaty water. These two exceptions, however, are neither common nor extensive.

There is no need to enlarge on the methods by which control against these three carrier species has been achieved. They are matters of common text-book knowledge to all malarialogists. But certain points are not brought out in Watson's '*Prevention*', probably because they were so familiar to him that they did not strike him as deserving mention. Again certain new methods have been evolved in the eleven years since his second edition appeared. The primary object of this paper is to bring these together, in which sense it may perhaps serve as a sort of appendix to 'Watson'. Following him, the notes are collected under each species, rather than under localities, most of which present certain aspects of all these problems.

Anopheles ludlowi.—The distribution of this species is patchy. It occupies its entire zone on the Selangor coast, with which Watson mainly deals in his book, but elsewhere in the peninsula there are many miles of the zone that, though they appear suitable for it, are free.

The delta of the Prai River, the rail terminus opposite Penang Island, is one of the most notable in this respect. The underlying reason has apparently not been investigated.

The malaria caused by *ludlowi* is generally more of an epidemic than an endemic character. These epidemics correlate with suddenly-increased breeding facilities, such as are caused by a period of low rainfall, on which especially high tides supervene, leaving pools, followed by heavy rain storms. Two years may often pass without any particular spot suffering, followed, sooner or later, by an outbreak. Figure 5 shows a pool where such an outbreak was in progress. The pool must have been nearly fresh, judging by the Nymphaceæ growing in it, in spite of a few Rhizophoræ to be seen in one corner. A specially-high tide had topped the banks of a canalized outfall channel, flooding a scrub area normally protected by the road as a bund, leaving open pools and 'salting' ponds such as that illustrated. The village



Fig. 5.—*A. ludlowi* pool, Kuala Langat district.

near by (Chinese shopkeepers) was very badly attacked.

If a fresh breeding area for *ludlowi* is created by clearing mangrove above the daily tide range, an outbreak seems to follow immediately. Such had occurred recently at Port Swettenham in connection with the making of an aerodrome. For this the first step was bunding the area. Then the mangrove was cut down, and, though kutchra drains and oiling were started *pari passu*, in the two months this took to complete an outbreak occurred.

On the other hand *ludlowi* can and does cause endemic malaria. In the Kapar area (Watson, 2nd Edn., Chapters V and VI) spleen rates rise from 0.5 per cent. to over 20 per cent. immediately flight range is reached.

On the flight range of *ludlowi* very divergent views exist. I was shown an estate where the species had always bred within 38 chains of the coolie lines, without causing trouble, for 13 years. That this was not an effect due to absence of gametocytes was proved when, owing

to lack of weeding and collection of coconut shells, on account of the financial stringency, *umbrosus* gained an entrance, and a first outbreak resulted which was brought under control without touching the *ludlowi* focus. In the endemic Kapar area above referred to, spleen rates rise one mile from the nearest *ludlowi* breeding ground, whilst Dr. Dawson of Singapore informed me that he had at times found *ludlowi* in his own bungalow, situated 2 miles from the nearest known breeding ground.

According to Prof. Williamson, *ludlowi* is more dangerous the further it flies from its breeding ground. He informed me that the adults rapidly die if forced to drink their own breeding water, but if they get fresh water to drink, they live longer, thus naturally a higher percentage survive to the gland-invasion stage. I was shown a squatter area within the Singapore municipality and not yet sanitated, where every hut is surrounded by ponds and tanks very like Lower Bengal, nearly all breeding *ludlowi*. The salinity of these is probably very high. Here there are occasional mild epidemics, but not more than 10 per cent of the children, judged by blood examination, are ever affected. This accords well with Williamson's hypothesis. On the other hand the estate with *ludlowi* at 38 chains distance is against it, as there the species always has fresh water in the drains above the tide gates, at least for many hours each day.

Regarding the control of *ludlowi*, no change in the methods described by Watson seems to have been made. At Singapore I was shown an interesting special case on the Grove Estate. Formally under rubber, this area was banded for agricultural purposes by its owners. The rubber has now made way for a suburban residential area. The drains to the tide gates are not deep enough to deal at periods of small tide range with the increased flow due to house sullage. The difficulty is met by the small concrete-edged lake (Fig. 6), into which

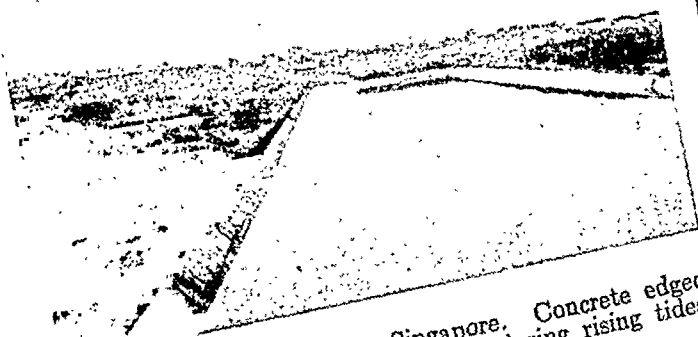


Fig. 6.—Grove Estate, Singapore. Concrete edged collecting lake for surface drainage during rising tides, emptied by electric pump.

excess fluid falls, with an electric pump to throw the water over the bund. This is of course the system one sees controlling the marshes near Ostia in the Tiber delta.

Anopheles umbrosus.—The standard method for dealing with this species is to fell and drain the jungle up to the flight limit. On Sungei Mangis estate such drains appeared to be naturally oiled by some substance apparently emanating from a moss growth on their sides. The phenomenon is apparently uninvestigated. Two actions are then involved, and either may be the controlling factor. It would seem probable that drainage, involving water movement, is really the most potent, for as Watson himself points out (2nd edition, pp. 213-14) 'a current of water means its certain destruction and disappearance'. The drain in figure 3 is, according to Dr. Barrowman, beginning to be dangerous owing to the overgrowth of weeds. This again might be attributed to a shading action, but with at least equal probability it could be said that grass was growing down into the water and affording larvæ shelter from current. The point is an interesting one that has not been definitely decided. Would a drain, sufficiently scrub growth, such as *Duranta*, sufficiently densely to prevent any grass growth, breed *umbrosus* whilst it was flowing? But seeing that danger would immediately arise if such a drain became blocked by earthfall the experiment would need very careful supervision to ensure accuracy. Again, if a portion of the swampy forest was cleared without drainage, would *umbrosus* disappear from the lighted undrained area? No work seems to have been done on this either. The problem has distinct practical importance in the light of what is now happening on estates due to the present financial crisis.

Anopheles maculatus.—This species and its control is pre-eminently the major problem of Malaya. *A. ludlowi* and *A. umbrosus* together affect but a narrow littoral and sub-littoral belt, *A. maculatus* exists—in esse or in posse—throughout almost the entire peninsula. Given hilly ground—and Watson has shown in his paragraph 'What is a hill?', how small an elevation fulfils this postulate—the species is almost universal, immediately the virgin hill forest is interfered with.

The classical researches of Strickland furnished the explanation of the phenomenon observed by Watson, of the relationship of light, through felling, to *maculatus*; how it is enabled to replace the harmless anophelines of the unlighted hill jungle. Watson discovered that no sort of surface drainage would deal with *maculatus*, and thus developed the system of subsoil drainage so closely associated with his name. But subsoil drainage to-day is not in all respects the system left by Watson, or the system described in the appendix of 'Malaria' by Col. Knowles and the present writer. It was inevitable that the original work should

have been capable of improvement, and improvement there has been.

First and foremost, the pipes have been laid deeper. From the 18 inches depth originally tried they have gone down to 5 feet, and the batteries of small pipes illustrated in 'Prevention' (e.g., figure 42) have given place to



Fig. 7.—Ravine in Venning Road area, Kuala Lumpur, part of Watson's original protection scheme for the town, after relaying the pipes on the present system, showing trenches where hill-foot lateral pipes have gone in, and central open concrete invert.

pipes up to 12 inches diameter. Secondly, the herring-bone layout has given place to a central pipe with hill-foot laterals leading at intervals to the central pipe, the blind ends of succeeding branches overlapping those preceding and



Fig. 8.—Ravine 'A'—Sungei Buloh Leper Asylum.

beginning to turn inwards. Thirdly, surface flow is taken by an open central concrete invert laid close to but not immediately above the main pipe, instead of leaving the whole floor of the ravine under grass. Figure 7 shows a ravine in the Venning Road area at Kuala Lumpur, originally piped and drained by Watson, after adoption to the latest method. The ungrassed

trenches where pipes have been laid or lifted show up clearly.

Variations from this standard necessarily exist. The most recently-piped ravines of all, those at Sungei Buloh Leper Asylum, where ravine 'A' (Fig. 8) is said to be the largest ravine so far dealt with in Malaya, have no central invert. At Gunong Pulai Waterworks, the construction anti-malaria work on which is so fully described and illustrated in Hunter's monograph, the side ravines are directly piped to the open invert (Fig. 9). But here it is necessary to make clear once and for all a fact not mentioned by Watson, but which has always puzzled the writer and perhaps many others, and that is that the beautiful wide-bottomed ravines of Malayan illustrations are not natural, but artificial. What was in nature the usual V-sectioned ravine has been artificially broadened by cutting into the sides and using the earth so obtained to level the rocky bottom and afford a covering for the pipes without an enormous



Fig. 9.—Gunong Pulai Waterworks, Johore (Singapore Municipality). Pipes of side ravine led to open channel. Vegetation over pipes too long for safety.

amount of excavation and blasting. This has apparently been so self-evident to the numerous Malayan writers that none of them have mentioned it. Further, they have not explained that unless the grass growth in such ravines is continuously kept short, the roots speedily block the pipes. Mowing machines have been tried, without much success apparently, and

everywhere one sees gangs of coolies hacking at the grass growth, as does the less sophisticated Indian *mali*, with primitive iron blades. The heavy annual upkeep charges (5 per cent. on capital) given for this type of drainage will then be understood. In a country where fresh milk is almost unobtainable, in private houses or hotels, one wonders why suitable grasses are not put down and the regulation of the grass growth left to cattle. There must be a reason, but one wonders what it is.

The problem of root blocking of the pipes is a very serious one. On Petaling Hill in the residential area of Kuala Lumpur I saw pipes that had to be lifted twice annually section by section, a bamboo being pushed through from one open point to another to clear the root growth, that emerged in tangled masses resembling coir. In such residential areas residents object to too much devastation among their ornamental shrubs to keep the pipe lines sufficiently far from tree growth. On the famous Seafeld estate no less than 115 acres out of 2,700 under rubber (over 4½ per cent.) has been cleared to keep the pipe lines free from rubber root interference, whilst the grass cutting as above proceeds continuously.

At Kuala Lumpur I saw pipes being actually laid, and again learned something not mentioned either by Watson or the P. W. D. specification. Naturally the bottom of the open trench is full of muddy water. Pipes are now laid from below upwards, the antithesis of former procedure. In the first pipe laid is placed a bundle of grass attached to a piece of thin rope wound round a stick. As length after length is laid (the coolie screws the ends against one another to get a close fit and then lutes the upper half of the joint with clay) the stick with the rope is passed through the new length before putting it down, and the straw plug is subsequently pulled forward into the new section of pipe when in position, thus keeping out silt from the completed length below. No stones and ballast are now laid over pipe lines, as no one wants water to percolate from above, but only to enter from below.

Again, Watson states that the top end of a pipe line must be in dry ground beyond the seepage. This is no longer found to be necessary. A pipe line may now commence where a small stream enters a controlled area, the top-most length of pipe having its free end permanently closed with a plug to exclude silt. I saw the head of such a ravine at Sungei Buloh. A small stream emerged from the jungle and fell on to a stone apron, which prevents scouring, and was taken up immediately by the pipe.

Scharff, at Penang, has developed perhaps the highest refinements of the engineering war against *maculatus*. But Scharff is thrice blessed; he is allowed to do his own engineering work, and has not to hand his ideas over to the P. W. D. for carrying out! Figures 10 to 13 illustrate points in the control of a *maculatus*

stream in Penang, from its head to its mouth. Figure 10 shows a vertical rock seepage, as now dealt with. The masonry wall is rubble filled



Fig. 10.—Penang. Seepage on vertical rock face covered by rubble behind the retaining wall.

to bury the seepage. At the foot of, but outside the wall, is the pipe—though in an oiling scheme it could be an open drain. Short lengths



Fig. 11.—Penang. Ravine with inspection wall and silt trap (just cleaned out), at junction of side pipe and change of direction of main pipe.

of pipes lead under the wall at intervals to collect the seepage passing through the rubble—what an improvement on the laborious plugging of each seepage point, or periodical spraying of the whole face with oil, that is done elsewhere!

[Cuttings on the new railway into Singapore, seeping high up, have this carried by vertical rubble insets to the track-side sub-soil pipes, no masonry facing being used.] Figure 11 shows an inspection well at a point where there is a



Fig. 12.—Penang. End of subsoiling of ravine on brick road, with washing wall for villagers. The opening of the pipes is very clear.

side pipe junction and for change of direction (marked as explained by Stewart in his 'Notes on a visit to the Malay Peninsula', *Indian Med. Gaz.*, LXVI, 173). The inspection well in question contained a silt trap (just cleaned); others contain a well for villagers, who thus get a continuous supply of the purest water. Figure 11 shows the end of the pipes on the beach, providing bathing arrangements for villagers. Figure 13 the end of the open drain to sea. This is covered from above high tide mark to below wave action at low tide. This obviates sand

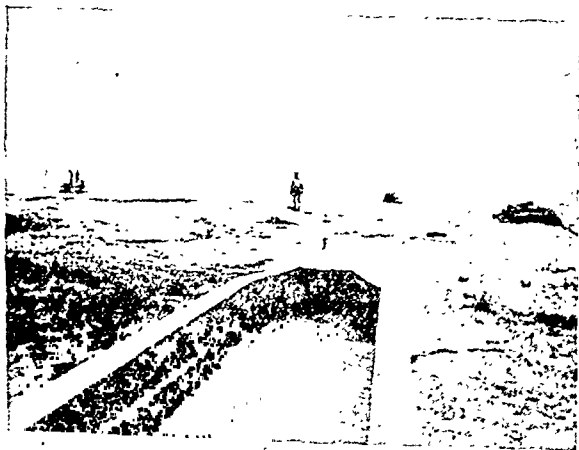


Fig. 13.—Sea end of open channel in ravine, carried in tunnel to below wave action at low tide.

blocking the end of the channel, which now costs about Rs. 1,000 per annum to remove in similar circumstances at Vizagapatam Harbour.

Scharff, alone in Malaya, seems to make use of Paris green. To the writer it was astonishing to learn that this substance was in bad repute in Malaya. I feel it has not had

sufficient trial, but the only sample I saw was amorphous and not granular, and much more work seems indicated before it should be condemned. Scharff uses it, at the astounding concentration of 17 per cent., on the main stream in the beautiful Botanic Gardens at Penang. This cannot be piped owing to volume, nor oiled for æsthetic reasons. It is a boulder ravine, very steep in slope, and Paris green is said to be quite efficient, in spite of the current, reaching the pot holes where *maculatus* mainly lives.

Another interesting difference of opinion was encountered. Hunter's method of keeping a ravine under open drainage and oiling for some months before sub-soiling is well known and is extremely logical. Dr. Barrowman, on the other hand, states that if a drain has been oiled, or if temporary oiling is done over blocked pipes, subsequent piping will be a failure, owing to the oily silt preventing the water reaching the pipes. There is a wealth of practical experience in Malaya that has never appeared in print.

Further instances of this may be given. Watson states that even a concrete invert serves the breeding requirements of *maculatus*, whose most efficient tail-hooks will maintain it even against such a current. Later experience seems to have modified this. Figure 9 shows a piped-side ravine at Gunong Pulai flowing at the bottom over a concrete invert to the main open channel, the ends of the pipes being visible in the illustration. When the Tangling area at Singapore was originally controlled, the ravines were all piped. Now these pipe lines have given place to concrete inverts, with only side seepages piped in short lengths to the central channel. But the argument here is less valid, for in my opinion a most beautiful instance of biological control is quite possibly the cause. When the piping was first put in, there were many fewer bungalows in this area than there now are. The area is not connected to the sewage system of the city, but groups of bungalows have small septic-tank plants. (These are often very close to the houses but work so well that no smell nuisance results). The effluent from these, plus kitchen sullage, is led to the concrete channels, and I suggest that the water in the main channels is now unsuited to *maculatus* in consequence. The finest effluent must contain more ammonia than a seepage!

This naturally leads one to the most far-reaching work of all, work still unpublished, but which is fundamental, and which, when its author makes it known, will in my opinion be epoch making. Considerations of time and distance, to my infinite disappointment, prevented me from seeing it, but its author did me the honour of coming into Kuala Lumpur and explaining it personally. I refer to the purely biological control of *maculatus* that is being worked out by Prof. Williamson at the hill station of Cameron's Highlands in Pahang State.

This station is being developed during the present period of depression. Money is not available for the pipe drainage that would normally be installed. The cartage of oil 90 miles from the nearest railway station is equally out of the question. Williamson has been put on to control *maculatus* biologically, as he has always maintained in his papers could be done, if enough were known. I have his permission to describe his methods briefly, but complete understanding of them must await his publishing, with explanatory hydrobiological analysis in demonstration. In the first place there is a periodical flushing system, somewhat as described by Russell in the Philippines, but the gates are made from packing cases at under \$1.00 each. Secondly, certain streams have been luted all across their beds with a local white China clay, water flowing over which was found to be naturally sterile. But to my mind the most beautiful example is that illustrated in figures 14 and 15, for which I am indebted to the author of the work. Here was a



Fig. 14.—Upland *maculatus* stream, Cameron's Highlands, in process of conversion into a series of small lakes.

typical *maculatus* stream of the uplands. Sets of tree trunk dams converted it into a series

of pools with miniature water-falls. These pools were then filled with manure and leaf mould from the forests.

Nymphaceæ and with them, unwittingly, *Utricularia* were introduced. As a result

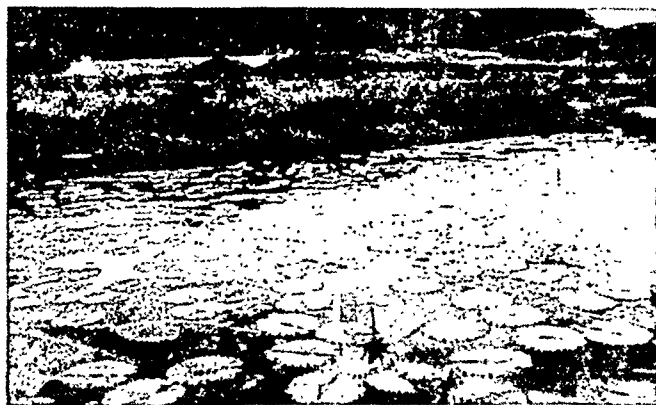


Fig. 15.—Part of same stream as Fig. 14, now covered with Nymphaceæ, *maculatus* absent.

maculatus has been replaced by *sinensis* and *barbistrotris*! Williamson does not claim that his method is of universal applicability. Probably very uniform conditions of rainfall are necessary if the dams and the impounded vegetation are not to be swept away. But the method is still in its experimental infancy. The progress of the researches, for such they really are, are hidden in an unpublished series of monthly progress reports. A biologist and a few coolies have replaced the hit-or-miss shell-fire costs of pipes or oil. It is beautiful in its simplicity, the complexity of which will only be apparent to those who have worked on the basic factors of mosquito ecology.

In conclusion the writer would express his deepest thanks to the following co-workers who freely gave up much of their time to him and afforded him transport over the areas in their charge :—

Dr. Scharff, Senior Health Officer, Northern Settlements and his Chief Sanitary Inspector, Mr. de Villiers; Dr. Barclay Barrowman, successor in Sir Malcolm Watson's former estate practice at Klang, and his assistant, Dr. L. A. Watson; Dr. Reid of Kapar; Dr. Anderson, Health Officer, Port Swettenham; Dr. Farris, Health Officer, Selangor Coast; Dr. Hunter, Chief and Dr. Dawson, Deputy Chief Health Officer, Singapore Municipality; Dr. Vickers, Health Officer, Kuala Lumpur Municipality, and Mr. MacClure, Assistant Anti-Malaria Engineer.

Dr. Badenoch of Sungei Buloh Leper Asylum and Dr. Castellaine, Health Officer, F. M. S. Railways, discussed their malaria work with the writer. To Dr. Neave Kingsbury, Director, Dr. Green, Malaria Research Officer, Mr. Blair, Chief Chemist, and Mr. Hodgkins, Entomologist, at the Institute for Medical Research, Kuala Lumpur, my most grateful thanks are due for many an hour's most interesting discussion and exposition, while to Prof. Williamson I have paid tribute in the body of this article.

KOCH'S DISCOVERY OF THE TUBERCLE BACILLUS—ITS IMPORTANCE AND SIGNIFICANCE

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It was just fifty years ago that Robert Koch made the epoch-making discovery of the tubercle bacillus as the cause of tuberculosis. The first announcement of this discovery was made by him in March 1882 before a meeting of the Physiological Society of Berlin and the modern era of tuberculosis may be said to begin from that date. Before this discovery tuberculosis was believed to be due to some defect in the constitution of the individual—'habitus phthisicus' of Hippocrates.

When Koch made the important discovery, he believed that the bacilli causing the disease in man and animals were identical. It is rather strange that a shrewd observer like Koch should have overlooked the difference between human and bovine tuberculosis although it was foreshadowed by Villemin as far back as 1868. Koch was also inclined to regard, at first, avian tuberculosis as identical with human and bovine tuberculosis, but after further investigations he agreed with Maffucci who first differentiated avian bacilli from mammalian bacilli (1890). So much was the medical world carried away by Koch's opinion that no one questioned the identity between human and bovine tuberculosis. The only dissenting voice was that of Klein who claimed that Koch's work had not clearly established the identity between the two (1883). In 1898, Theobald Smith recorded the results of his investigations on human and bovine strains of tubercle bacilli and proved that the two strains were not identical. But on the whole, no heed was paid to these discoveries and the general belief in the identity between human and bovine bacilli remained undisturbed. The medical world was, therefore, taken by surprise when, in 1901, Koch made the startling announcement before the British Congress of Tuberculosis that human tuberculosis was different from bovine tuberculosis and that bovine tuberculosis was not transmissible to man.

The assertion that bovine tuberculosis was not transmissible to man, naturally provoked a storm of opposition and led to an enormous amount of experimental investigation all over the world. The result of this investigation has been an enormous advance in our knowledge of tuberculosis. Perhaps the most important fact that has emerged from this investigation is that pulmonary tuberculosis which forms the most important type of human tuberculosis is, for all practical purposes, the outcome of the human tubercle bacillus. It is very rare indeed, for pulmonary tuberculosis to be caused by the bovine bacillus and, as Fishberg has observed, pulmonary tuberculosis caused by the bovine bacillus is a medical curiosity deserving of careful reporting every time it is discovered. At the same time it has been found that Koch

underestimated the danger from the bovine bacillus being transmitted from cattle to man. Koch in overstating his case did great service to mankind in that he attracted the attention of the public authorities from a too exclusive concentration on animal sources of infection to the phthisical human being who is the chief source of infection to man.

In his original description of the bacillus, Koch had described the presence of spores, but this has since been found to be incorrect. Experimental evidence has further shown that the tubercle bacillus discovered by Koch represents but one phase in the life-history of the micro-organism which is capable of polymorphism. In 1908, Hans Much described the granular phase of the bacillus by a special method of staining in lesions in which no acid-fast bacilli were found. He also established their specificity by inoculation experiments and considered them to be the developmental stage of the tubercle bacillus. These granules have since been called after Much's name. In 1910, Fontes described for the first time the filterable form of the bacillus and later, Haudouroy and Vaudremer described the passage of the virus through Chamberland L3 filters. Much work has since been done for and against the filterable phase of the bacillus and the result may be considered as *sub judice*. The above discoveries have resulted in the description of the life-cycle of the tubercle bacillus which includes a stage utterly invisible by any method, a finely granular phase, a coarsely granular phase, and finally a mature stable bacillary form.

A recent development in the bacteriology of the bacillus is the 'dissociation' experiments carried out with it by Petroff and others. By means of cultures on suitable media, they have succeeded in isolating two kinds of colonies—one kind having a rough surface ('R') and the other having a smooth surface ('S'). The 'R' colonies contain an avirulent variety of the bacillus and the 'S' colonies contain the virulent variety.

After the discovery of the tubercle bacillus and its growth on artificial media, Koch attempted to make use of the bacillus and its products in the treatment of tuberculosis. In 1890, he announced the discovery of what is called old tuberculin (T. A.) which was followed later by new tuberculin (T. R.). Since then, an enormous variety of tuberculins has been prepared for treatment. But the use of tuberculin as a therapeutic remedy in tuberculosis has proved a dismal failure. Tuberculin has, however, rendered one important service; it gives valuable information about tuberculous infection which is not synonymous with tuberculous disease. Investigations on large scales have proved that a very large majority of adults in civilized countries harbour tubercle bacilli in their bodies. In adults, a positive reaction is, however, not of much significance, but a negative reaction is very valuable as it

indicates virgin soil. In children, the value of the test is great. A positive reaction is of some significance in a child under 5 years, but in a child under 2 years it is of serious import owing to the risk of dissemination of the bacilli from the focus of infection. In children, the test is sometimes negative in spite of the presence of infection when sensitivity has not developed. Similarly in some adults, the test is sometimes negative in the terminal stages of chronic tuberculosis and also in pregnancy and parturition, and in certain acute infectious diseases like measles, scarlet fever, enteric fever, and influenza.

In 1891, Koch discovered a peculiar phenomenon which has since been associated with his name. He found that when tubercle bacilli are injected into an already-infected guinea-pig, it reacted quite differently from when they were injected into a healthy animal. While in the healthy animal apparently nothing abnormal was noticed, in the infected animal the inoculation was followed by severe clinical symptoms and ulceration at the point of inoculation. The phenomenon of Koch, as this reaction to reinfection is called, forms the basis of all tuberculous processes that take place in the diseased body. The term 'allergy' was coined by Von Pirquet to define the state of a body infected with the bacillus and means 'altered reaction'. The allergic phenomena are, as a rule, inflammatory and are, without doubt, manifestations of immunity and tend to localise or ward off the disease by causing destruction or fixation of the bacilli.

Ever since the discovery of the tubercle bacillus, many attempts have been made to produce prophylactic immunisation against tuberculosis. Many methods have been recommended for the purpose but the important ones are vaccination with (1) virulent living tubercle bacilli, (2) virulent dead bacilli, (3) pseudo-tubercle bacilli, and (4) living avirulent tubercle bacilli. It was found that virulent living organisms were too dangerous for the purpose and the results with dead bacilli were not satisfactory, while the pseudo-tubercle bacilli conferred no protection against tuberculosis; for the last purpose Friedmann's turtle-bacillus vaccine was tried. It was thought that a lasting immunity could be obtained by the use of living but avirulent tubercle bacilli. With this idea, Calmette and his co-workers in France have produced a vaccine, now well-known as B. C. G. According to Calmette, the bacillus was originally of virulent bovine origin but after repeated cultivation on glycerine-potato-ox-bile medium for a number of years it has lost its virulence. Calmette claims that 'B. C. G. differs from ordinary preparations containing tubercle bacilli only by its almost total lack of virulence. It possesses definite antigenic properties and consequently produces anti-bodies and in culture media forms tuberculin. But B. C. G. is perfectly harmless for all animal species-susceptible to tubercu-

losis'. Calmette believes that most of the infection in children takes place by the digestive root and for this reason and also because of its simplicity he advises the administration of B. C. G. by mouth within the first ten days of life. But experiments by others have shown that B. C. G. given by mouth does not produce a positive Von Pirquet reaction, though when given subcutaneously it does so.

Petroff has carried out 'dissociation' experiments with B. C. G. and has been able to isolate 'S' colonies from it. He therefore claims that while Calmette has been able to eliminate gradually most of the 'S' colonies, allowing the 'R' to predominate, the virulent 'S' colonies have not been completely eliminated and though present in small numbers they may, under favourable conditions, increase in number to such an extent that reversibility of virulence will take place. In Petroff's opinion, therefore, the use of B. C. G. as a prophylactic measure is fraught with danger.

Calmette has produced a very large number of figures to substantiate the value of B. C. G. but his statistics have been subjected to very severe criticism by Greenwood. The trend of the medical opinion at the Conference of the International Union against Tuberculosis held in Oslo (Norway) in 1930 seemed to be in favour of Calmette. In the opinion of the conference B. C. G. produced temporary immunity against mild infection.

Such, in short, has been the advancement in our knowledge of the tubercle bacillus since the time of its discovery by Robert Koch. All this would not have been possible without this great gift which Koch gave to medical science—the discovery of the tubercle bacillus. As Koch truly said, the gold was lying on the surface when he began, but later was to be mined only with hard labour. Much has been accomplished; much remains to be done by concerted effort to discover the deeper mysteries of tuberculosis. His discovery only has made it possible for us to appreciate that tuberculosis is caused by infection by the tubercle bacillus brought about chiefly by inhalation and ingestion. The former is the more important route in pulmonary infection with the human bacillus and the latter in man is the route taken by the bovine bacillus. By carefully-controlled and compulsory pasteurisation of milk, all practical risk of bovine infection could be eliminated. The most potent source of pulmonary infection is germ-laden sputum. It should be our duty, therefore, to urge on the public the importance of sputum precautions and on the authorities concerned of the importance of pasteurisation of milk.

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(Continued at foot of opposite page)

NOTES ON THE STUDY OF PLAGUE IN THE FIELD

By W. J. WEBSTER, M.C.
MAJOR, I.M.S.

OUR knowledge of the relationship of rats, fleas and man so far as they concern the epidemiology of plague is undoubtedly far from complete. This is true even in India although the problem there is less complicated than in some countries. Those who are in a position to study plague in the field (*i.e.*, outside the laboratory) are often concerned with urgent problems connected with evacuation, inoculation, trapping and baiting, disinfection and disinfestation. Most of the information required to carry out this type of investigation is to be found in voluminous reports and in articles scattered in different periodicals, which are not readily available for the field worker. I have endeavoured to give a few practical points which may be of assistance to field workers; enquiries have been received from time to time about most of these points.

In field studies it is desirable to obtain information regarding the local rodents in contact with man, to ascertain which species of fleas are parasitic on these rodents and the extent of the infestation, and to determine the presence of plague infection in rodents and fleas, respectively. The collection of this information entails the examination of rodents alive and dead, the carrying out of flea counts, the capture of wandering fleas, and the bacteriological confirmation of plague infection in both rodents and fleas. Any evidence of plague infection among the rarer rodents and those not in contact with man should be noted as opportunity occurs. The exact importance of the human flea has yet to be determined. Details regarding the incidence of human plague are required for correlation with the other data.

Classification of rodents.—All rodents handled should be identified as far as possible. In the plains of India the majority of the rats in towns and villages are varieties of *Rattus rattus*. Brown, white-bellied, black, and 'other varieties' are classed together in plague work. This species and bandicoots, mice and rodents of the genus *Gunomys* are easily recognised and *R. norvegicus* may be met with in the larger ports. *Gunomys* has been mistaken for *norvegicus*, and, for those of us who are not zoologists, it is sometimes useful to remember that the angry *Gunomys* grunts, while a frightened *norvegicus* emits a prolonged squeak (Webster and Chitre, 1930). The recognition of the species of some of these may be difficult. Musk

rats are easily recognised by the long fleshy snout. They are not rodents but insectivora, like moles and hedgehogs. On the Bombay side at least they are not susceptible to plague. They are important domestic natural enemies of house rats and they sometimes harbour fleas. With the rarer rodents the question is mainly of zoological interest, but identification of the rodent host is particularly desirable when unknown fleas are sent for classification. Adults with worn teeth are to be preferred when specimens are sent to experts as it may be impossible to classify immature animals. Formalin is not a good preservative for rodents. An absolutely fresh specimen with the belly slit open should be put in spirit. Write the location, altitude, date and sex, and also the fresh measurements of head and body, tail, hind foot and ear on a label tied to the carcass (Hosack, 1907). Preparation of pelts for museum purposes is quite an art. The skull and distal bones of the limbs are retained with the hairy skin.

Diagnosis of plague in rodents.—The first evidence of plague in a locality is often the occurrence of rat falls. This may be a source of anxiety to the local public health official. He is presented with rat carcasses in various stages of decomposition and is expected to give an immediate verdict as to whether they died of plague. It has recently been demonstrated by Goré and Chitre that it may be impossible to prove 48 hours after death that a rodent died of plague. High rodent mortality is not necessarily due to plague. For example *Gaertner* and *Pasteurella* infections, other than *pestis*, may kill many rodents, the *Danysz* virus has been used in rat campaigns, and *tularæmia*, in countries where it occurs, is likely to be mistaken for plague. The ideal, therefore, is to obtain recently-dead rats. This may demand careful search. Rat falls mean visits from sanitary officials and much inconvenience to the residents. The latter may prefer to conceal the fact that a rat fall has occurred or to transfer the evidence to a safe distance.

Carcasses should be examined for naked eye signs of plague. Particular search should be made for buboes as these are easily overlooked by the inexperienced. The other signs are well known—subcutaneous and muscular congestion and hæmorrhages, enlargement, moulding and mottling of the spleen, moulding and peppering of the liver, and pleural effusion are among the most regular. The chief signs of chronic plague are abscesses at the site of former buboes or in the spleen, and fibrotic areas in the spleen from any of which plague bacilli may or may not be isolated. Somewhat similar post-mortem signs to those of plague may be due to other conditions such as trypanosomiasis (*T. lewisi*) and other *Pasteurella* infections.

Smears from the bubo, heart blood and spleen should be examined for the presence of plague-like bacilli. The smears may be fixed in absolute methyl alcohol, or by heat, and then

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stained with 1 per cent. carbol thionin blue for two or three minutes. For smears to be sent to a distant laboratory it is perhaps most satisfactory to fix in absolute alcohol for ten minutes and dispatch unstained. The absence of plague-like bacilli in smears from a fresh carcass is against a diagnosis of plague. Many organisms in smears, however, resemble the plague bacillus. Post-mortem examination and the study of smears will often give a reasonably definite diagnosis, otherwise it is necessary to attempt to recover the plague bacillus by cultural methods or to transfer the infection to a healthy animal.

In the case of a really fresh carcass a few drops of heart blood, taken with a sterile pipette through a seared portion of the heart surface, and added to one cubic centimetre of sterile citrated saline in a small test tube may remain satisfactory for laboratory examination for some days. The subsequent procedure is not impossible in a field laboratory. Details are given later.

For other than fresh carcasses perhaps the most reliable means of diagnosing the case as plague is to rub the cut surface of the abdomen on the recently-scarified surface of the spleen of a susceptible animal. It is good practice to use two animals for each suspected spleen; these are kept under observation until they die or until they have survived for three weeks. The scarification is carried out by dry shaving with a razor. This procedure is indicated where there is a suspicion of plague but with indefinite post-mortem signs. Wild rats are suitable for the purpose if previously defleaed and quarantined.

The search for plague infection among live rodents may appear to be disappointing. Rats which are obviously ill are not often obtained. Plague is an acute disease and can be diagnosed only during the last 24 or perhaps 48 hours. Chronic plague is rare, in some places very rare. Even during a severe epidemic only a small proportion of captured rats may give evidence of infection.

The degree of immunity of the local rats to plague infection is always a matter of interest. The number of survivors after cutaneous infection of, say, a hundred of the rats gives a rough indication of the susceptibility. More refined methods with some attempt at measuring the dose of the infection, and comparison with a control of a known breed of susceptible rats, are to be preferred.

Rat catching.—Trapping of rats is carried out practically everywhere but it is not for that reason a simple procedure. Rats rapidly become trap-wily and bait-wily. Whether the wholesale destruction of rats during plague outbreaks is advisable or not is a moot point. The usual index of the prevalence of rats in an area is the number of rats caught per hundred traps set. This index is thoroughly unsatisfactory. The number of rats caught depends on many

factors besides the density of the rat population. Perhaps the most important factor is the person in charge of the trapping. It is not proposed to discuss the question of trapping or rat destruction in detail but it may be mentioned that for *R. rattus* and *R. norvegicus* the 'Improved Elongated Wonder' trap has been found satisfactory. Various types of box traps and wire traps are also available in the open market for these species as well as for bandicoots and mice. Breakback traps and well and barrel traps are useful in rat campaigns but are not applicable to flea survey work. The most attractive baits must be discovered locally.

Rat flea surveys.—Considering the trapping for the moment as a means of obtaining flea counts it is desirable to deal with rats caught singly. Otherwise the balance of ectoparasites is upset by fighting and sweating, and cannibalism is also a trouble. The aim should be to have as many rats as possible caught singly with the facilities available. Adult rats should be selected for flea counts, firstly because young rodents may be difficult to identify, secondly because the smaller the animal the fewer the fleas, other things being equal. Another point is that the trap and rat should be secured before there has been any disturbance of the fleas from excitement of the host or exposure to sunlight. Traps should therefore be collected at daybreak and those considered suitable should be put in strong bags which can be completely closed. The bags having been collected, each in turn is put in a suitable-sized box and partly opened up. A pad of cotton wool soaked in petrol or chloroform is put in the box which is then completely closed. After about twenty minutes the contents of the bag may be emptied on a suitable surface such as white oilcloth and searched for parasites. This must not be hurried and the carcass must be thoroughly brushed, combed and thumped on a hard surface to dislodge the fleas before being put aside for identification and dissection.

Identification of fleas.—The fleas collected may be examined at once (e.g., in glycerine under a coverslip) and if of easily-recognisable species may then be discarded or put up for culture. Otherwise they may be stored in 70 per cent. alcohol or cleared and mounted. A suitable procedure is to soak the fleas overnight in 10 per cent. caustic potash, then for a night in water; after an hour in 50 per cent., 90 per cent., and absolute alcohol respectively they are put in clove oil until clear and then mounted in xylol-balsam or euparal.

In India where the three common *Xenopsylla* and perhaps *Pulex irritans* are being studied, the individual flea put up for culture (*vide infra*) can when dissected be put under a low power objective of an ordinary microscope for identification. For the recognition of live fleas of these species Taylor's capillary tube method is very convenient (Taylor and Chitre, 1923).

Live fleas are easily manipulated if a large piece of white surgical lint is spread out, woolly side uppermost, to limit their movements. The use of a few drops of chloroform on the cotton-wool plug of a test tube to kill the contained fleas does not interfere with cultural tests for plague infection.

Specimens of unknown species may be sent to an expert. Professor Wagner of Belgrade wishes to receive specimens of rare fleas from India. It is important to record the place of capture and the host. Such fleas may be placed in 70 per cent. alcohol in small tubes. Particulars may be written with a lead pencil or special ink on a piece of paper which is put inside the tube. A plug of cotton wool dipped in melted paraffin (candle grease) is pushed a little way into the tube which is then corked and the corked end dipped in melted paraffin. The tubes may then be packed in metal or wooden boxes.

The important figure for comparative purposes is the specific flea index, *i.e.*, the average number of each species of flea per rodent, each species of rodent being considered separately. Some system of marking the collection of fleas from each rodent is therefore essential pending identification of both. Notes regarding other ectoparasites may also yield interesting information. When the rats are dissected the number of fetuses in the case of pregnant females should be noted, as giving an indication of the breeding season.

Plague infection in fleas.—The best method of detecting this is to dissect out the stomach and proventriculus of each flea and emulsify them in a drop of saline. A small loopful of this may then be smeared on the surface of a blood agar slope (Goré, 1929). Any typical colonies apparent after 48 hours at 37°C. may be further studied by the methods detailed later.

Smears of individual crushed fleas may be stained and examined for the presence of plague-like bacilli, but only a proportion of the plague-infected fleas will be detected thus and the morphology alone is not really conclusive.

Another method is to grind up a number of fleas, say 20, in sterile saline and then to inject the emulsion subcutaneously into a susceptible animal which is then observed as in the case of a cutaneously-infected animal. This procedure is a suitable preliminary to demonstrate that there are plague-infected rat fleas (or indeed human fleas) and is likely to be useful for off-season investigations. If the results are positive, further study with distinction of the species and sex of the fleas is indicated.

Disinfestation of rodents.—The test animals used for the inoculation experiments should first of all be freed of ectoparasites. An effective method is to dip the rodent momentarily in petrol, but unfortunately a considerable mortality sometimes follows this practice. Hand picking of fleas into a test tube with the aid of a repellant, of which spirits of camphor applied

with a cotton-wool swab is one of the best, can be quite satisfactory if carefully carried out. These rodents should be kept in cages suspended by wires to prevent reinfestation and after inoculation they should also be kept in this fashion to avoid infection of stray fleas. Long-handled clamp forceps are convenient for holding wild rodents during defleaing, but it is rather difficult to obtain these of a suitable type, so perhaps the use of stout leather gloves or a thick piece of cloth is more generally applicable.

Fleas apart from the host.—Wandering fleas may be obtained by allowing one or more guinea-pigs to run loose in the premises under investigation. The fleas are recovered by hand picking. Flea traps have been used. Human fleas may be collected from the floors of houses or from the legs of volunteers who enter vacated dwellings. Otherwise they will rarely be found on human beings such as plague patients. It is very desirable to obtain more information regarding this species.

The blocked flea.—Bacot's blocking phenomenon is of great interest and importance, but in the present state of our knowledge the study of this condition in the field is very difficult. A blocked flea cannot be recognised with certainty until its feeding powers are tested on a living animal. A partially-blocked flea may not be recognised even then.

Tabulation of data.—Careful records of observations must be maintained if the results are to be of any value. It is important to write down every particular which may be required later on, and to do so in such a way that figures illustrating special points may be easily abstracted from the records.

For example a serial record of all rodents handled might show the following data:—serial number, date, locality, species, sex, if pregnant the number of fetuses, total number of fleas, other ectoparasites, if plague infected. Then for each area or village a separate list might give details for only one species of rodent, particularly the number of fleas of each species. The sex of the fleas should also be distinguished. With regard to locality it may be of importance to note the type of premises in which the rats and fleas are captured. Thus grain stores, mills of various kinds, residential and business areas may be available for comparison. In towns the floor of the house may be noted. In rural areas the vegetation and crops may be of interest. If ships are examined the type of vessel, the recent ports of call and the kind of cargo are among the points to be noted.

The method of analysis of the figures obtained will depend upon the scope of the investigation. Adequate monthly flea counts are desirable, failing which, figures comparing plague season and off-season should be aimed at. Graphs and maps are often very useful for demonstration purposes.

Meteorological observations.—Climatic conditions being of great importance in plague

epidemiology. it is essential to have a record of meteorological data during field studies on plague. At the least, daily maximum and minimum wet and dry bulb readings, respectively, should be available. Records merely of the actual temperature at a fixed hour each day may be very misleading. A thermograph which gives a continuous record of the wet and dry bulb levels and which requires attention only once a week is very convenient but rather expensive. The important figures for comparative purposes are the mean monthly temperature and humidity.

There has not so far been much investigation of the conditions inside rat burrows, at least in India. We know too little about this subject. It is of great interest for example to determine whether, in the off-season, plague persists in the burrows in rats or fleas or both. Buxton (1932) has recently given some suggestions as to how the climate in rat burrows may be studied.

Confirmatory tests for *Pasteurella pestis*.—Returning to the bacteriological proof of plague infection, the secret is to obtain single colonies of typical appearance before proceeding to confirmatory tests. From the citrated saline suspension of heart blood for example a series of one-tenth dilutions is prepared and from these the surface of blood agar slopes is inoculated. The method of dilution using platinum loops of standard sizes is convenient (Goré, 1924). Place three five-millimetre loopfuls of saline in three separate hollows of a sterilised glass plate. Add a one-millimetre loopful of the suspension to the first hollow: after mixing transfer a 1-mm. loopful to the second hollow: mix again and transfer a 1-mm. loopful to the third hollow. Now working backwards use a 1-mm. loopful of each dilution to smear the surface of blood agar slopes. It is convenient to use a whole slope for the third dilution and a single tube marked off with a grease pencil for the first two dilutions. After 48 hours at 37°C. isolated colonies may be found on one or other of the slopes.

Having obtained typical colonies the confirmatory tests are as follows:—

1. **Morphology**—smear a colony or two on a slide with the aid of a 1-mm. loopful of saline. Allow to dry, fix and stain as above. Stain another smear by a Gram's method, preferably Jensen's modification. Study the morphology and staining characters.

2. **Carbohydrate reactions**—rub up one or more colonies in glucose, mannite, lactose and saccharose media (all 1 per cent. in peptone water with an indicator). Incubate at 37°C. for 48 hours. Glucose and mannite should show acid without gas while lactose and saccharose are unchanged.

3. **Protein reactions**—rub up a few colonies in a tube of peptone water. Put a few drops of 5 per cent. lead acetate solution on the inner end of the white cotton-wool plug. Incubate at 37°C. for 24 hours. The plug should not show blackening (= absence of H_2S). Place a

5-mm. loopful of this 24-hours peptone water culture on a white opal glass plate and mix with it a 2-mm. loopful of Ilosvay's reagent. A pink colour should appear within a minute (= presence of nitrite). Ilosvay's reagent should be freshly prepared by mixing equal parts of (a) Sulphanilic acid 1 gm., glacial acetic acid 14.7 c.cm., distilled water 285 c.cm. and (b) Naphthylamine 0.2 gm., glacial acetic acid 14.7 c.cm. and distilled water 325 c.cm. To the inner end of the plug of the same 24-hours peptone-water culture (covering the end of the plug with white cotton wool if necessary) add first a drop of 1 per cent. potassium persulphate and then a drop of Ehrlich's rosindole reagent. (Paradimethylamidobenzaldehyde 1 gm., absolute alcohol 95 c.cm. acid hydrochlor. conc. 20 c.cm., the whole mixed with an equal quantity of rectified spirit.) Incubate for 24 hours. There should be no pink colour on the plug (= absence of indol).

The appearance of the colonies of plague bacilli after 48 hours growth is soon appreciated with a little practice. Textbooks and teachers lay great stress on the difficulty of distinguishing *Bacillus pseudo-tuberculosis rodentium* from the plague bacillus. The former gives a negative nitrite test (Goré, 1930) and grows just as well on agar as on blood agar. The plague bacillus grows very poorly on agar. If equal amounts of a suitable suspension of plague bacilli are grown on agar and blood agar respectively there may be a hundred times as many colonies on the blood agar. This does not apply to direct cultures of blood and tissues where the admixed blood or tissue fluid supply the necessary additional pabulum on the agar.

It is hardly necessary to point out that all personnel engaged in field work on plague should be kept protected by full doses of Haffkine's prophylactic at least once a year.

A great deal of valuable information may be collected by work on the lines indicated. There are many minor points of interest. For example we know very little about the extent to which rodents and fleas are conveyed from place to place in different kinds of merchandise and in different forms of transport. Finally there is ample scope for originality in devising methods for the study of plague in the field.

I am indebted to Dr. Goré and Rao Bahadur Chitre for teaching me all they know about plague.

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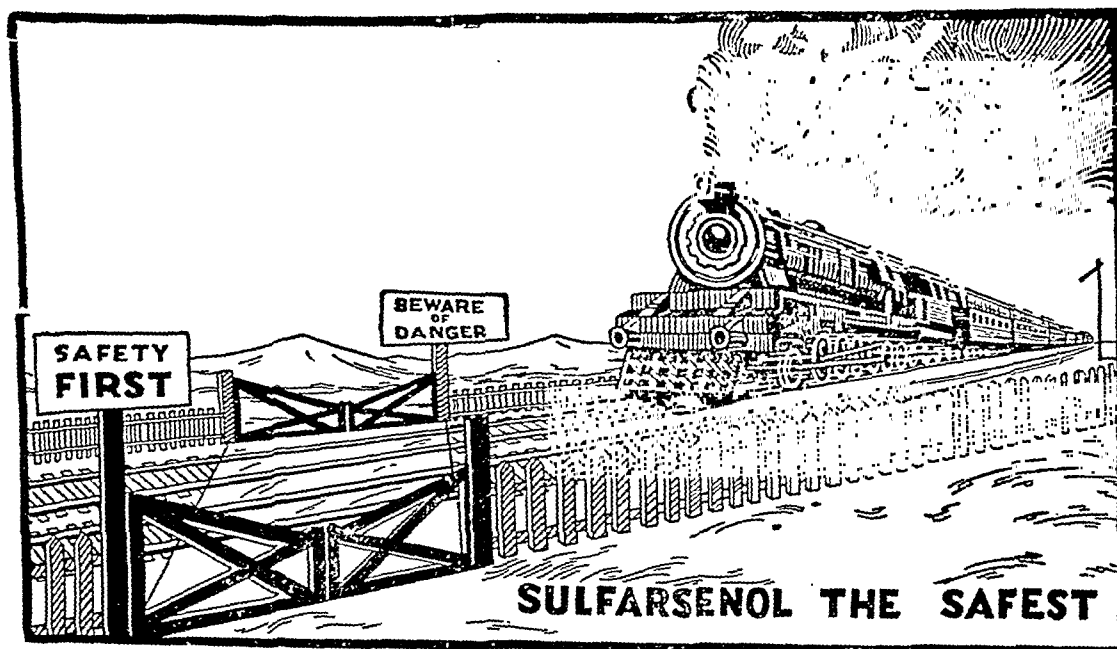
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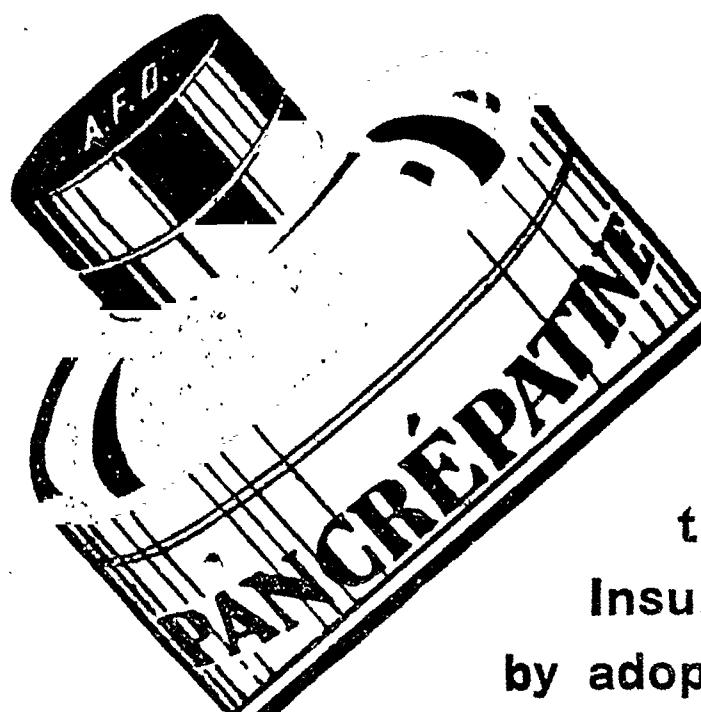
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Indian Medical Gazette

DECEMBER

ROBERT KOCH

This year is the jubilee of Robert Koch's discovery of the tubercle bacillus. Although this discovery was possibly his most notable piece of work, yet had the tubercle bacillus been first discovered by some other worker Koch would still stand out as one of the greatest names in the history of bacteriology. In India we owe him a special debt not only for his discovery of the universal tubercle bacillus but because of his work on one of our indigenous diseases, cholera, and his demonstration of the causative organism, the vibrio which now bears his name.

Koch did not show any particular promise as a student and his career at Gottingen was not marked by any great academic successes. Like so many men whose lives were outstanding events in medical history he started his medical career as a general practitioner. His practice was in a country district near Breslau. At Gottingen he had been a pupil of Jacob Henle, and it would appear that, even if this great teacher was not rewarded by the immediate success of his pupil, his teachings had sunk in deeply, to come out during the leisure hours of a private practice. There seems to be little doubt that Koch had been much influenced by Henle's *contagium animatum* theory of infectious disease. These theories regarding the association of micro-organisms and various diseases were at that time gradually gaining adherents, but the opposition to them was still very strong. However, the ideas on the subject were very vague, and the specificity of these organisms and their ability to live and multiply away from the diseased tissues in which they had been seen had hitherto scarcely been suspected. Koch's attention was first directed to that dramatic disease, anthrax, which had broken out amongst the cattle in his district. He worked out all the main facts in the ætiology of the disease as they are known to-day. The organism itself had already been seen and described by Davaine and later by Ehrlich, but it was Koch who first passaged it through a series of animals and showed that it still retained its virulence; he showed the exact conditions under which it could be grown outside the body; he demonstrated its aerobic nature and the conditions under which spore formation, which enabled the organism to resist the action of desiccation, heat and strong chemicals, occurred. Working entirely alone, in the isolation of the country, with few facilities, he produced a thesis on the specificity

of the anthrax bacillus and on its artificial cultivation which was complete enough to convince immediately a body of scientists at Breslau, and thereby he laid the foundations of practical bacteriology of to-day. Only those who have worked in an institution and have known the great value of the suggestions and criticisms of one's colleagues can appreciate fully the remarkable nature of such an achievement. Yet there are moments when one wonders if it was not because of, rather than in spite of, this isolation that so many epoch-making discoveries were made by self-taught workers, and that possibly the field of vision of the trained scientists was limited too much by tradition and the experience of others to allow them to see all the wider possibilities.

The outstanding merit of Koch's work was immediately recognised and he was soon relieved of the work of his practice and given every opportunity to continue his investigations. Koch's great *forte* was technique. For example though bacteria had been stained before, it was he who introduced the methods of fixing and drying smears, which are still in use to-day. It was as a direct result of his abilities in this direction that in 1882 he discovered the tubercle bacillus. He used methylene blue—introduced the previous year by Ehrlich; to this he added an alkali solution which allowed the dye to penetrate into the bacilli and to remain there despite subsequent treatment with Bismarck brown. He was not of course content with merely staining the bacillus, but as in the case of anthrax he presented to the world a complete and irrefutable thesis and it was in connection with this piece of work that he enunciated his famous 'postulates', which served their day but are now seldom referred to except for the purpose of harassing examinees.

About that time Europe was becoming alarmed at the frequency of the recurrence of cholera pandemics, and in 1883 Koch was sent out at the head of a commission to investigate cholera in Egypt and India. It was at post-mortem examinations on persons who had died from cholera that Koch, working at the Medical College, Calcutta, demonstrated the vibrio as the causative organism of this disease.

During the next twenty-two years he continued to add to the reputation he had established. Working with Berlin as his centre he was sent from time to time to distant parts of the world to tackle various problems connected with epidemic disease. However, we do not propose to enumerate here the long list of his successes, or to discuss his few failures.

It is impossible to gauge the importance of Koch's pioneer bacteriological work in the advancement of medical science. His methods of cultivation and isolation of bacteria form the very foundations on which the whole science of bacteriology, as it exists to-day, has been built. It is to the credit of his country in

particular and the scientific world in general that his merit was recognised—from his own country he received both material and honorific rewards, and from all over the world scientists flocked to his laboratory at Berlin. One can to-day scarcely turn a single page of a book on bacteriology without encountering the name of one or other of his students; these included Gaffky, Löffler, Pfeiffer, Welch and Kitasato.

Koch died on 27th May 1910, at the age of sixty-seven; at his own request his body was cremated and the ashes kept at the Institut für Infektionskrankheiten in Berlin, which he founded and of which he had been the Director until six years before his death.

'A STUDY OF INDUCED MALIGNANT TERTIAN MALARIA'*

WORKERS in Great Britain on induced malaria therapy in mental patients have the advantage of working with 'clean' material under fully controlled conditions, and of being able to select recipients who have never previously been exposed to infection with malaria. The consequence is that their results are often surprising to workers in the tropics who are far more often dealing with relapsing or recrudescent malaria. This very important memoir by Colonel James and his colleagues forms no exception to this rule. It constitutes a notable contribution to malariology and should be read in the original by all malaria workers in the tropics.

The authors commence by claiming that in such a well run hospital as Horton it is justifiable to treat mental cases by infections with *P. falciparum*, especially the type of case which has failed to benefit by benign tertian or quartan infections. There were three fatalities among the first 22 cases treated (one being due to advanced carcinoma), but none among a subsequent series of over 50 cases treated. The mortality from induced malignant tertian malaria worked out at only 4 per cent. as compared with a figure of 10 to 14 per cent. for patients treated with benign tertian malaria in mental hospitals in England and Wales.

The paper deals with 54 patients so treated, 31 infected by direct blood inoculation, and 23 by mosquito bites; 33 of them having received a previous course of malaria therapy and 21 of them having had no malaria previously. (The 33 patients who had previously received a course of malaria therapy were presumably then inoculated with *P. vivax*, but in their figures for relapses the authors do not seem to recognize that this may possibly have affected the relapse rate after subsequent inoculation with *P. falciparum*.)

Eight strains of *P. falciparum* were used for the experiments. These were as follows:—

- Rome I, II and III strains in infected *A. maculipennis*.
- Sardinia strain—also in infected *A. maculipennis*.
- West Africa strains I and II—in infected *A. gambiae*.
- Indian strains I and II, obtained by collecting blood from cases at the Seamen's Hospital, Albert Docks.

The work recorded in this memoir raises two outstanding problems with regard to *P. falciparum*. The first is as to whether there is more than one species of malignant (crescent-producing) parasite. Here the authors find that the strains used remained true to morphological type, whether in the original donor, in patients infected by direct blood inoculation, or in patients infected by mosquito bites. No morphological differences could be discovered, the analysis of the temperature charts showed a true tertian periodicity due

to groups of parasites sporulating every 48 hours. Morphologically the strains, whether Italian, Indian or West African, appeared to belong to one species of parasite—*P. falciparum*.

A more difficult question is as to whether there was any difference biologically—and especially as regards virulence—in the different strains employed. And here the authors come to very important conclusions, for the Italian and West African strains proved far more virulent than did the Indian ones. For the cure of the induced malaria far more quinine had to be given and over a much longer period of time in the case of the Rome and Sardinia strains than in the case of the Indian ones. Thus the average total amount of quinine administered to cure was 1,680 grains per case with the Rome I and Sardinia strains, as against an average of 117 grains with the Indian I and II strains. In almost every case infected with the Italian strains intensive quinine treatment had to be instituted at once, whereas in no case infected with the Indian strains was this necessary. In general the fever was much more severe and more prolonged with the Italian strains than with the Indian ones.

Further, relapses were much more frequent and lasted much longer with the Italian strains than with the Indian ones. Of 19 patients inoculated with the Indian I and II strains 16 relapsed, but no relapses occurred later than 11 weeks after the primary fever; of 13 patients inoculated with the Rome I and Sardinia strains 11 relapsed, and 7 of them lasted for more than 21 weeks. These differences are illustrated in a very striking chart. (Workers in India, who are not accustomed to regard infections with *P. falciparum* as especially associated with relapsing malaria, will be considerably surprised at these figures and this chart, instructive as it is.)

Lastly, blackwater fever occurred in two patients inoculated with the Italian strains, whilst a third patient passed into a 'pre-blackwater' stage with jaundice; nothing of the sort occurred in patients inoculated with the Indian strains. Patient no. 9 was inoculated four times between 1st January, 1930, and 8th August, 1930, with the Indian virus. The last two inoculations failed to produce fever, no parasites could be detected, and it was concluded that he was now immune to the Indian strain. On 13th December, 1930, he was inoculated by direct blood inoculation with the Sardinia strain; after an incubation period of only three days a severe attack of malaria set in with parasites in the blood and quinine in doses of grains xxx had to be given for 18 days; parasites persisted in the blood up to the 11th day of the attack. Thus immunity to the Indian virus did not appear to confer immunity to the Sardinia virus.

The Italian strains proved readily transmissible by *A. maculipennis*. Seven batches were successfully infected with one or other of the four Italian strains, the mosquitoes in some of the batches being infected to the extent of 100 per cent. On the other hand all attempts to infect *A. maculipennis*—six consecutive experiments and hundreds of mosquitoes used—with the Indian strains failed.

The authors conclude on the above evidence, and with considerable justification in our opinion, that biologically strains of *P. falciparum* may differ profoundly in their virulence according to the country or area from which they come.

Many observers have noted that the temperature chart in malignant tertian infections may be very irregular. It is often of quotidian intermittent type—sometimes of irregular remittent type. The duration of the paroxysm is as a rule much more prolonged than in the case of infections with *P. vivax*. Marchiafava and Bignami divide the course of the paroxysm in typical malignant tertian infections into five stages: (1) the sudden febrile onset with a temperature abruptly rising to 104°F. or so; (2) a period when the curve oscillates; (3) a pseudo-crisis with the temperature dropping; (4) the pre-critical rise of temperature; and (5) the true crisis. The whole paroxysm is usually very

* James, S. P., Nicol, W. D., and Shute, P. G. (1932). A study of induced malignant tertian malaria. *Proc. Roy. Soc. Med.*, XXV, No. 8, June, 1932. *Sect. Trop. Dis. and Parasit.*, p. 1153.

long, generally exceeding 24 hours and often lasting 36 or 40 hours'.

The authors comment on the great frequency with which the 'Marchiafava and Bignami' curve was seen in their cases, and seek for its explanation. Usually, it is held that sporulation of *P. falciparum* is less mathematically regular than with *P. vivax* and *P. malariae*. The schizonts are rupturing and setting free their merozoites over a period of some hours, instead of all rupturing almost spontaneously—hence the irregularity of the temperature chart. This, the authors believe, is not the case. They consider that each brood of *P. falciparum* sporulates at exactly the 48th hour, but that the patient may have anything from two to five or more broods of parasites in his blood at the same time; each brood sporulates exactly at the 48th hour of its cycle, but the result of the multiple broods present is that the temperature chart is irregular. They recognize the following main types of temperature chart:—

(1) The 'single tertian' type with a regular 48 hour periodicity and rigor. There may be acceleration—to 40 to 44 hours—or retardation—to 52 hours—in the sporulation of the single brood of parasites present.

(2) The type with two dominant groups of parasites, each sporulating 24 hours after the other. This gives a quotidian type of fever.

(3) A type with two dominant groups of parasites, but with the interval between their sporulation very much less than 24 hours, it may be only 16 hours. Here the paroxysms are more frequent than one in every 24 hours.

(4) A type where two groups of parasites are dominant, but their time of sporulation almost coincides. This gives the 'Marchiafava and Bignami' curve with its pseudo-crisis, then a slight fall in temperature, checked by the sporulation of the second brood of parasites, a second rise in temperature, followed by true crisis.

(5) Types where three broods of parasites are dominant, all sporulating at different times. This, the authors claim, is the commonest set of events in malignant tertian malaria, both in the primary attack and in relapses. There may even be three paroxysms of fever every 24 or 36 hours, and the temperature may only drop to normal every 48 hours.

(6) Cases with four, five or more broods of parasites sporulating at different times, giving rise to subcontinuous or irregular fevers.

The proof that these different broods of parasites are present simultaneously in the patient's blood at the same time, claim the authors, lies in the fact that administration of quinine at the appropriate time will suppress sporulation of one brood of parasites, removing its effect from the temperature chart, which will then reflect the sporulation of only the remaining brood or broods.

(Ingenuous as is the above account of the fever in malignant tertian malaria—and illustrated by very instructive temperature charts, we consider that it raises several difficult points. For instance does a single mosquito at a single bite inject different broods of sporozoites, destined to become schizonts maturing at different times; or is an attack of malignant tertian malaria usually the result of several bites by different infected mosquitoes, each injecting its own single brood of sporozoites? The authors' explanation of the irregularity of the temperature chart in malignant tertian infections differs profoundly from the usually accepted and orthodox view.)

The authors consider that there is no need to postulate a species of malignant parasite with a 24-hour schizogony cycle. Quotidian malaria can readily be explained on the above grounds, without the creation of a new species of parasite.

The authors next proceed to a study of the general course of the disease in malignant tertian malaria. Here their opportunities for observation were unique for every case was followed from its very inception

until months after its last relapse with a wealth of detail, and, as a result, their general account of malignant tertian malaria differs in some respects from the textbook accounts—based on cases observed in the tropics.

It is now well known that the incubation period in *P. vivax* infections may be a very prolonged one. Thus, workers in Holland have shown that patients bitten in the autumn by infected mosquitoes may not develop the fever until the following spring. James and his colleagues in a previous paper have recorded cases where the incubation period was six months or even more. They find, however, that nothing of this sort occurs in infections with *P. falciparum*. In mosquito-infected patients the longest incubation period was 17 days, the shortest 6 days, and the mean of all cases 12 days.

Most cases of malignant tertian malaria cease to 'recrudescence' within two months after recovery from the primary attack, but a number still continue to do so for a much longer period, and the period during which 'recrudescences' are still occurring merges into the period of 'relapses', and indeed in some cases into the period of 'recurrences'.

'Recrudescences' occurred both in patients infected by mosquito-bite and in those infected by direct blood inoculation. Out of 36 cases recrudescences occurred in 29. And here the authors write as follows:— 'According to the results set out above, quinine treatment of the primary attack brings about a permanent cure in less than 20 per cent. of cases of malignant tertian malaria as compared with 50 per cent. for cases of the benign tertian disease. The usual sequence following recovery from the primary attack is a series of recrudescences occurring at intervals of approximately ten days. Taking one strain with another the number of these recrudescences resulting from a single infection is, on an average, four, but there may be as few as one or as many as eleven. The recrudescences are obviously brought about by repetition of the process which led to the primary attack and are due to the persistence and multiplication of the ordinary asexual parasites. As yet we have no evidence of the occurrence in malignant tertian malaria of "relapses" or "recurrences" in the sense in which we used those terms in connection with the benign tertian disease. The duration of the disease as manifested by febrile attacks is seldom less than a month and seldom longer than six months'.

(These findings will come as a surprise to workers in India who are accustomed to regard malignant tertian malaria as far more amenable to quinine therapy than benign tertian infection. Further, the prolonged period over which recrudescences occur is rather surprising.)

'Clinically', continue the authors, 'malignant tertian malaria, in its general course, is an acute disease consisting of a severe primary attack followed by several less severe recrudescences occurring at relatively short intervals. So far as we know at present this comprises all the febrile manifestations resulting from a particular infection. In this respect it differs strikingly from benign tertian malaria in which there are, in addition to recrudescences, much later manifestations which we call "relapses" and "recurrences"'. Thus malignant tertian malaria is correctly described as an acute disease as opposed to benign tertian which is a chronic one'.

Not only is the fever milder in the recrudescences than in the primary attack, but the parasite counts are lower. Thus an average of 20 cases observed gave in the primary attack 161 rings per 100 microscope fields; first recrudescence 37 rings per 100 microscope fields; second recrudescence 28 rings per 100 microscope fields; and so on.

These parasite counts are of interest as they may enable one 'in the field' to determine whether one is dealing with a primary attack or with a recrudescence.

Finally, cessation of febrile attacks does not indicate in all cases complete extermination of the parasites. In the series of 54 cases studied in the paper, ring forms were encountered as late as 159 days after recovery

from the last febrile recrudescence, and crescents for a corresponding period of 53 days.

In their final section the authors come to the subject of treatment. In benign tertian malaria there is a striking difference between the therapeutic effect of quinine in cases induced by blood inoculation and in those induced by the bites of infected mosquitoes. They find that in malignant tertian malaria this difference does not exist. Different individuals infected with the same strain may differ very much in their susceptibility, some being very susceptible, others normally susceptible, others quite refractory. Two fatal cases of explosive, fulminant type were seen, one infected by direct blood inoculation with the Indian II strain, the other infected by mosquitoes with the Sardinia strain. In one patient infected for the third time by intravenous inoculation of the Indian strain 9 grains of quinine were sufficient to effect a cure.

Each recrudescence is less severe than the preceding one, and the patient gradually acquires tolerance or immunity. 'This being so', write the authors, 'it seems clear that, whenever it is possible to do so, it is in the best interest of patients suffering from malignant tertian malaria to use quinine only very sparingly for the treatment of recrudescences, and even (provided that there are good nursing and laboratory arrangements) to withhold this drug entirely in some of the recrudescences with the object of allowing the patient to acquire the tolerance which alone (in the absence of a drug capable of completely eradicating the infection) seems to bring about permanent recovery'. (This finding is very important for it means that—as long as good nursing facilities are available—it is better to let the patient's malaria run its course untreated until the patient's natural powers of immunity are aroused, and then to give quinine as an adjuvant to these powers, rather than to try to exterminate the infection in its early phases by massive doses of quinine. The immunity acquired by the former procedure will be of a much more solid and lasting character than any transitory immunity gained by the latter procedure.)

The authors conclude from this that a 'standard treatment for malaria' should only be resorted to when it is unavoidable. The factors in each individual case should be considered. Malignant tertian malaria contracted in India may be much more amenable to quinine therapy than the same disease when contracted in Italy. 'If the two Indian strains of *P. falciparum* with which we have worked are common strains in that country it is not surprising that in India it is frequently stated that infections with this parasite are easily cured, or that a "standard quinine course" employed there gives better results than in parts of Africa or Italy or Eastern Europe. Our observations introduce a new difficulty in the subject of chemotherapeutic tests of antimalarial drugs, for it is obvious that we must now limit comparative tests to patients infected not only with the same species but also with the same strain of the parasite'.

With regard to the dose of infection 'we find in general that the primary attacks of cases infected by the bites of many infected mosquitoes are more difficult to control and are of longer duration than of cases infected by the bites of only one or two insects'.

The authors' final conclusions with regard to quinine therapy are so important that we may quote them in full.

'The principal conclusion which we draw from the above summary is that the time has passed when it can be regarded as satisfactory or sufficient to make a diagnosis of "malaria" and to begin at once a "standard quinine treatment". Nor is it sufficient to know the species of parasite concerned and to prescribe the particular system of quinine treatment which up to now has been considered most appropriate for an infection of that type. Evidently what one must do now is in the first place to endeavour to learn much more about the case than (in our experience) it has usually been the practice to learn hitherto. In this connection field

workers and hospital physicians in all malarious parts of the world should endeavour as soon as possible to add to existing information on the clinical virulence of the particular strains of *P. falciparum* prevalent in the countries where they work. Are all the strains in India as mild as those reported in this paper and are all the Italian strains as virulent? If a patient is able to say in what place he contracted the infection shall we have at hand information indicating what will be the probable course of his illness? From the history and from the laboratory report can one say whether he has a primary attack or a recrudescence and, if the latter, how many more is he likely to have before permanent recovery? From all the information obtained, would one be justified in withholding quinine for a short period to ascertain by frequent blood examinations and clinical investigation whether the parasitic infestation and signs and symptoms are diminishing "spontaneously" or are becoming more pronounced? And, if available information is insufficient, should one begin treatment with relatively small doses of quinine to ascertain what dosage may be the least that will still permit the patient to acquire an immunity against further recrudescences, or should one stop the attack at once by giving daily doses of 20 or 30 grains and by so doing deprive him of the opportunity of gaining that tolerance? Then again, when the attack is over, should one advise "anti-relapse treatment" of 10 grains of quinine daily for three or four months or longer and, when one does so, should the patient be advised that, to avoid a possible risk of blackwater, he should not increase the daily dose if (despite this treatment) he gets another recrudescence?

These are some of the problems of quinine treatment that have arisen during the present study: we realize fully that the solution of some of them is still far to seek'.

Finally come the authors' trials of atebtrin. The first trial was on four cases of malignant tertian malaria which had continued to relapse for more than six months after their primary attacks. The dosage given was 0.3 gramme daily for 5 days. In all the infection was promptly eradicated and there was no further recurrence during the subsequent 28 weeks that the patients were under observation. Out of four patients infected with the same (Rome I) strain three were treated with quinine, and the duration of infection was respectively 26, 32 and 24 weeks; the fourth was treated with atebtrin, fever ceased on the third day, parasites disappeared after the fifth day, and there was no recurrence.

Repeated trials on batches of patients infected with the same strains, some treated with atebtrin, and some with quinine, in every instance showed the great superiority of atebtrin. The five-day treatment was in all cases sufficient to eradicate both fever and parasites, and there were no recrudescences or relapses, whereas with quinine four to five recrudescences were the rule. In only one out of seventeen cases treated with atebtrin was there a recrudescence; and this was promptly cured by a further course of seven days' atebtrin treatment. 'To sum up, with regard to the above successful results they are important not on account of their number but because each experiment was arranged with a view to eliminate the errors in chemotherapeutic trials caused by the influences described in this section under the heading "Treatment by quinine". We think that even a few trials of an antimalarial preparation conducted in this manner yield results which are more to be relied upon than a large number of trials made in circumstances where the only definite knowledge available about the cases is the specific name of the parasite found in the blood at the period of the trial, together with clinical details of the particular attack under treatment. It is evident that if the trials with atebtrin had been made on cases infected with either of our Indian strains or perhaps with one of our West African strains, the successful results would have little significance, for as good results might be obtained with

therapeutic doses of quinine. What is so noteworthy about the results is that they were obtained on cases infected with strains of *P. falciparum* against which quinine was proved to be so ineffective that permanent cure by means of it could not be brought about.

(We have given considerable space to a summary of this very important paper. Before we conclude, however, there is one point of criticism which we should like to make. The authors comment throughout on the relatively low virulence of the two Indian strains with which they worked as compared with the Italian and West African strains. But the Indian strains were obtained in blood taken from lascars at the Albert Docks in London who must have been in either a recrudescence or a relapse, whereas the Italian and West African strains were obtained in infected mosquitoes. It is generally agreed that passage of the malaria virus through the mosquito enhances its virulence; and had the authors obtained an Indian virus from infected mosquitoes the results might have been quite different. Colonel James must have forgotten his own Indian experience when he considers that Indian strains of *P. falciparum* may be in general of low virulence. We could take him to areas in India where the virulence of the local strain of *P. falciparum* is so high that blackwater fever is not the exception but almost the rule among the European residents. Also, under epidemic conditions Indian strains of *P. falciparum* may attain an extremely intense degree of virulence. This was exemplified in the great malaria epidemic in 1908 in the Punjab when malaria became a disease

which not merely caused fever, but a very fatal infection associated with a very high case mortality. Such conditions are not seen as a rule in the endemic areas.)

R. K.

A CORRECTION

During this year two papers have appeared in the *Gazette* dealing with a strain of *Plasmodium* found in a monkey. In these papers ('Observations on a *Plasmodium* Infection which causes Haemoglobinuria in certain Species of Monkey' by L. Everard Napier and H. G. M. Campbell, on p. 246, and 'A Study of Monkey-Malaria, and its Experimental Transmission to Man' by R. Knowles and B. M. Das Gupta, on p. 301), the monkey from which this strain was recovered was referred to as *Cercopithecus pygerythrus*. Subsequently some doubt arose as to the correctness of this identification, which had been accepted by the writers at the time, and more specimens were sent to the Director, Zoological Survey of India, for reconsideration of the question. With better material at his disposal he decided that the original identification had been wrong and placed these monkeys in the species *Macaca irus*. The dealers from whom the monkeys were purchased say—and there is every reason to believe the truth of their statements—that they are imported from Singapore. *M. irus* is a common monkey in the Federated Malay States, and *Cercopithecus* is an African genus. All available evidence therefore suggests that these monkeys belong to the species *Macaca irus*.

Medical News

THE LIGHTER SIDE OF THE BRITISH MEDICAL ASSOCIATION CENTENARY MEETING

(FROM A CORRESPONDENT)

READERS of the *British Medical Journal* are accustomed to seeing the pages of that excellent periodical mainly given over during the late summer months to reports of the Proceedings of the Annual General Meeting of the British Medical Association. Many medical men from India have doubtless taken the opportunity when at home of attending the meeting and have taken part in the pleasant social side of its activities, with its opportunities of renewing old friendships and making new ones. The programme is arranged on much the same lines each year, but this year the meeting was unique in that it was the Centenary Meeting and for the first time for 22 years was held in London, with its unrivalled opportunities for staging the proceedings in a dignified and impressive manner. It is hardly necessary to say that full use was made of these opportunities, or that the hospitality offered to delegates from overseas was generous in the extreme and evoked a lively appreciation. Indeed if the meeting had had no other purpose than to be a reunion of medical men from all parts of the Empire, for the promotion of mutual goodwill, it would have been a signal success, for which the organising secretary and the members of the various committees deserve the greatest credit. The press undoubtedly approved, if one may judge from the prominence which the leading newspapers gave to the proceedings day by day, though the items which the popular press selected for the limelight were not always those of the greatest scientific importance. For instance a learned disquisition on the functions of the spleen was not abstracted for the benefit of the public, but an indictment of the moral character of the modern schoolboy was and was responsible for several leaders and some rather heated letters from well-known headmasters. However these are matters in which the press doubtless has sound reasons for its judgment.

The addresses, scientific papers and discussions are to be found reported in full in the medical journals, but of the lighter side of the meeting little is to be gleaned from their columns and these notes are written in the hope that some account of this aspect may be of interest to those who had not the good fortune to be present.

The meeting itself is always preceded by the Annual Representative Meeting, at which the domestic affairs of the Association are passed under review and medico-political questions are discussed. This was held in the Great Hall of the British Medical Association House, whose striking scheme of decoration is well shown in the coloured plate in the History of the Association, and four days were allotted to tackle an agenda paper of about 100 items. From the character of most of these it looked as though the proceedings were going to be rather dull for overseas representatives, but this was far from being the case, on the contrary, as the meeting progressed one found that not only was one's interest aroused by the zest with which the motions were debated and by the flashes of humour, conscious and unconscious by which the proceedings were enlivened, but one came to realize the extent to which the British Medical Association has identified itself with the interests of the general practitioner at home. The tendency of legislation in Great Britain of recent years has been in the direction of bringing medical services more and more under official control as part of the activities of central and local authorities, with the result that the general practitioner is being superseded in many directions by whole-time medical officers. In the activities which are still left to him, apart from private practice, the general practitioner finds himself entangled in a network of regulations and liable to be trampled on by ministries, county councils, insurance act committees and other bodies on which he is scantily or not at all represented and which are not always too favourably disposed towards him. The British Medical Association is ready at all times to battle for the rights of the general practitioner, as the history of the insurance acts proves.

and as was shown in the discussions at this meeting on the staffing of council and other hospitals, to take only one example.

The resolutions on the agenda arose mainly out of the annual report of the Council, which had to be adopted by the meeting. The Finance Committee's report gave rise to some rather vague motions for economy, starting with a 10 per cent. cut of the officers' salaries. Many of the representatives had felt the east wind of retrenchment in the cuts of the panel fees, it was blowing strong in the north of Scotland, wailed the voice of one from that region and people up there knew what it meant to have to economise in their own homes, why then should the officials of the Association shelter behind the stout walls of the new building from its cutting blast? But the officials proved well able to tackle the critics and to convince them that not only were they worth their salaries, but that such trifling economies would not bring about a reduction of the subscription, the object aimed at, and these motions were lost or withdrawn. Interesting sidelights on general practice were thrown out by some of the speakers, we learned that it was not safe to engage a locum-tenent on the strength of an advertisement in the *British Medical Journal*, he might prove to be partially paralysed or otherwise incapable of performing his duties. We also learned that speculative builders employed the same advertising medium to attract 'silly young asses' of doctors to a new neighbourhood and that some men starting to practise as specialists thought that it was in order to provide free lunches for patients kept waiting, as also for their doctors if they cared to come to discuss the case. On the recommendation that Government should pay for first-aid rendered in motor accident cases, one learned the astounding fact that there were 180,000 road accidents last year. Much merriment was evoked by a witty speech by the daughter of a famous I. M. S. officer, formerly well-known in Calcutta, who practised near the famous (or as she preferred to say infamous) Kingston bye-pass road. Her vivid picture of an unfortunate lady medico dragged out of a crowded surgery, expected to bring all necessary appliances for treating anything from an abrasion to a fractured femur, getting her clothes utterly ruined by mud, blood and grease, treated with scant respect by first-aid workers doubtful of her credentials and finally receiving not a word of thanks, much less payment, for her services evoked hearty sympathy from the audience, many of whom had had similar experiences. One gathered that in this matter the Association had wrestled with insurance companies with a view to getting them to undertake the liability, but without success. All the representatives of the companies were sympathetic and agreed that the doctors ought to be paid, but thought that somebody else ought to do it. It was settled in the end that the meeting should tell the Council to tell Government to pay, but no one seemed very optimistic about the outcome.

These were a few of the lighter interludes amidst debates on such intricate matters as the proper staffing of Council hospitals without shutting out the general practitioner altogether, the granting of patents for new remedies produced by research workers (a thorny matter this affecting diverse trade interests), the provision of consultant services for insured persons (some asperities here) and on the masterly report on mental deficiency produced by the special committee. It was not easy for the overseas visitor, handicapped by lack of detailed knowledge of most of the subjects, to follow all the speakers and it must be confessed that, even with the aid of microphones, many of them were not too distinctly heard. However when his attention wandered there was a convenient ante-room to repair to, where he was certain to meet old friends of former years, in whose society the time passed pleasantly if all too quickly.

A patch of vivid scarlet appearing suddenly on the first morning and moving down the hall to the dais, accompanied seemingly by a learned counsel proved to be the Mayor and Town Clerk of St. Pancras, come

to give the representatives an official welcome, in a neat speech which drew from the Chairman in the course of his reply an invitation to come to some of the shows during the following week and see what the medical profession could put up in the way of gorgeous robes, in case he might think that they were a monopoly of civic dignitaries. Another pleasing interlude that day was an excellent lunch to overseas representatives at the Hotel Russell, which gave them the opportunity of meeting and thanking the Association officers personally, a duty which Dr. Row of Bombay undertook for India and accomplished very gracefully.

The Annual General Meeting took place on the third afternoon, when Lord Dawson of Penn was inducted into the President's chair by the Past President and made his acknowledgments. The President for next year was then formally elected and Professor Moorhead was a pathetic figure, accompanied to the platform by his wife, as he thanked the meeting and assured them that the fears which had been expressed that Ireland would not be in a fit state next year to hold a British Medical Association meeting there were quite groundless and that anyone who went there would find that he was renewing his youth in the exciting atmosphere of that island. Then came the presentation of the portrait of Dr. Cox to the Association and of the testimonial to him personally. Sir Humphrey Rolleston presided over this pleasant function and there was a note of deep personal affection in the speeches, to which Dr. Cox responded by making plain the reluctance with which he was giving up duties which had become his absorbing hobby and facing rather mournfully the emptiness of life on the retired list.

On the Sunday came one of the most impressive of the functions. Every year there is an official religious service, this year it took the form of a pilgrimage to Worcester, the town in which the founder Sir Charles Hastings passed nearly all his life. A special train left Paddington at an uncomfortably early hour under lowering skies and as we ran through Oxfordshire in pouring rain the weather looked of the gloomiest. Only a few of the 400 who attended were able to get to the brief ceremony of the unveiling of the tablet on Sir Charles Hastings' house, now a furniture shop. The remainder proceeded to the Guildhall to take their places in the procession, which walked through the streets, headed by the Mayor and Aldermen to the Cathedral, there to be met at the west door by the Dean and Canons. The populace showed their appreciation of this unusual spectacle by lining the streets in great numbers. The rain had ceased by this time and occasional gleams of sunshine enhanced the effect of the scarlet gowns and many-coloured hoods, and we were spared the dreadful possibility of umbrellas being used, in defiance of the traditions of the older universities. In the Cathedral there was a short service of dedication of the memorial window to Sir Charles Hastings, followed by a characteristically vigorous sermon by the Bishop of Birmingham, in which he dealt with the modern aspect of the conflict between the search for scientific truth and prejudice cloaked as religion, in a broadminded philosophical discourse, which would have made an admirable inaugural address at a medical society. The scene in the beautiful cathedral, the rows on rows of scarlet robed men filling the stately nave and the exquisite singing of the famous choir will not readily fade from the memory of any who were present. The colonial visitors, many of whom attended a service in an English cathedral for the first time, were deeply impressed by the beauty of the setting and by the colour and dignity of the whole ceremony; some of them were heard to say that only in the old country could things be done in such a manner. A huge marquee on College Green accommodated the whole party, now grown to some 700, for lunch after which a portrait of Hastings, which was painted in 1839 was handed over to the Association by Dr. Crowe, the Chairman of the Worcester Division. The party then split up, some going in coaches to see Droitwich Spa and its bathing establishment, others

remaining in Worcester to be hospitably entertained to tea at the Guildhall by the Mayor, who by the way is a lady, and afterwards visiting the Royal Porcelain Works, where there is a museum of Worcester china, old and modern, to be shown round which is an artistic treat for any china lover.

On the following day the representative meeting reached its concluding stages, but attention was distracted by the opening of the Centenary Meeting itself and by the transfer of its offices to the Imperial Institute. As tickets for most of the social functions, which had been announced for weeks beforehand in the *Journal*, could only be obtained by personal application and it was rumoured that there would be a rush, an early departure for South Kensington seemed advisable. The rumour proved to be only too true, big as the hall of the Imperial Institute is, it did not seem big enough to contain all the members who had conceived the same idea of coming early before the rush to register and get their tickets. Four thousand members actually registered, but judging from the dense throng at the counters, one would have been prepared to believe that there were even more than that number. The wide entrance hall of the Imperial Institute was used for the notice boards of the meeting, a comfortable lounge was fitted up in the Jehangir gallery and the trade exhibition was in the inner hall. The surgical section met in the Institute itself and the others in the near-by buildings, whose lecture theatres and class rooms were admirably adapted for the purpose. The weather was dreadful on the opening day and continued in the same mood right through the meeting, making the process of getting from place to place decidedly uncomfortable. Every member registering received an 'identity disc', of plain lead for plain members, but of enamel suspended by ribbons of many colours for officers and members of the various committees, so that the streets in the neighbourhood reminded one of those of an American city during one of the many 'conventions' which are such a feature of that country. The populace of London must have been much intrigued by the numerous yellow direction boards, obligingly affixed to lamp standards at road junctions by the A. A., extending even to the outermost suburbs and indicating that all roads led to the British Medical Association meeting. A copy of Muirhead Little's *History of the British Medical Association* was presented to each member and a Handbook of the Meeting, quite a substantial booklet giving not only the details of the official fixtures, but also particulars of some 200 excursions planned and a concise guide to London. The entertainments provided varied to suit all tastes, there were conducted tours round sections of London, visits to Hampton Court, Windsor or the City Halls, trips to Whipsnade or to condensed milk factories, runs on the river or short flights in an aeroplane, even for those who wished to see how mounted policemen are taught to ride or bus drivers to negotiate side-slips there were arrangements. Fleets of coaches waited outside the Imperial Institute to convey parties to these various destinations and without doubt the way to get the maximum of fun out of the meeting would have been to concentrate on these events and read about the proceedings of the sections afterwards in the *Journal*, as one suspects a good many did, though the idea obviously was to entertain the ladies thus whilst their menfolk were busy at the scientific discussions. The writer realised a long cherished ambition to visit a newspaper office and see the whole process of publication, from setting up on the linotype machine to the emergence of the paper all folded ready for distribution in a great room crowded with roaring machinery, reminding one of the engine-room of a liner. This was excellent value and there was a thrill in reading the paper several hours before publication, even though it catered for a public holding strongly socialistic views.

A wet journey back to Tavistock Square landed one rather late for the Conference of Overseas Representatives, a new feature this year. Most of this was devoted

to a discussion of hospital problems in the colonies, but towards the end, after the Punjab representative had made a suggestion that an all-India Secretary should be appointed, a cloud appeared on the horizon when an Indian representative complained that the Association did a lot for the I. M. S. but nothing for the general practitioner in India. The Deputy Secretary rose and gently pointed out that the Indian Branches must get together and submit proposals, the Council of the Association was always ready to take up matters brought to its notice, but so far no requests for help had been received from anybody in India except the I. M. S., which naturally worked through the Services Committee. The tactful intervention dispersed the small cloud and the meeting closed in harmony.

The battle at the ticket counter was renewed next morning, but as a respite there was provided a magnificent cinema film of living tissue culture, with an explanatory lecture by Dr. Canti. Cell movements are so speeded up in the film that one sees phagocytes darting at their prey and devouring it, macrophages prowling about, the fibroblasts growing under the eye, the whole giving one a vivid impression of the life of the tissue cells as independent units. Equally striking was a film showing the effects of radium on tissue cells growing *in vitro*. It is to be hoped that these films may be made available in India for teaching purposes. In the afternoon the Annual General Meeting resumed at Queen's Hall in academic dress to hear the President's address and never has the writer seen so much colour in the rather sombre interior of that building. The scarlet gowns were even more in evidence that evening at the President's reception at the Albert Hall, at which over 6,000 persons assembled and one enjoyed the unique spectacle of people dancing in this garb, a sight which never has been and probably never will be seen again in a university town. The floor of the Albert Hall had apparently risen several feet and submerged the stalls, so that the lowest tier of boxes was on the floor level. Around the room were rallying points for the various countries of the Empire, so that people who felt the need of consorting with their kind might find them without too much searching. The President and Lady Dawson performed a feat of endurance worthy of Royalty in shaking hands with all their guests, after which dancing began. Later on there was a pageant of the Progress of Medicine, in which we saw medical students walking across the floor dressed as Syme, James Paget, Joseph Lister, Jenner and other great men of the past century, their tight-fitting black frock coats and high stocks making one feel that if dress reform has still some way to go, it has at any rate done away with the worst discomforts men suffered in those days. Between them came detachments of nurses from the different hospitals, each cheered lustily by their old students. Then followed an excellent cabaret show, after which those who wished could go on dancing until that hour at which even the youngest is supposed to tire. The finest view was obtainable from the top gallery, which had the added advantage that it was approached by a lift and that hospitality was dispensed there with a most liberal hand.

For the serious minded the sections began their work next day and in the evening came the event of the programme, the reception at the Guildhall by the Lord Mayor and Corporation. Tickets were eagerly sought after and it was rumoured that only delegates and officials stood any chance of getting two tickets, the plain member would have to be content with one. Apparently there were ways of surmounting the difficulty, for the fair sex mustered in great numbers, though at no time was there anything like the crowd of the previous evening. Seen by day by the dim light of a London afternoon filtering through the stained glass windows, the Guildhall, with its dark timbered roof and gay dresses of the ladies, it was a sight of unforgettable if rather sombre magnificence. Lighted up at night with the floor crowded with uniforms, scarlet robes and the gay dresses of the ladies, it was a sight of unforgettable

splendour. The Lord Mayor and the Sheriffs with their ladies received the guests in the library, a modern but very beautiful room and the scene as the long procession was marshalled towards the dais, carpeted in royal blue, to the subdued music of a fine orchestra showed how well the organising of stately ceremonial is understood in the City. Passing on, one had the choice of listening to a concert, viewing displays of dancing, or joining in the general dancing in the Guildhall itself, which almost seemed sacrilege when one wandered round and read the tablets and inscriptions commemorating the historic events which had happened in that place. But the exquisite dance orchestra was calculated to dispel all such solemn thoughts, as also was the traditional hospitality of the City, which was dispensed with more than traditional lavishness in the crypt. Here too was the museum, with the City's ancient charters on view and in the art gallery, besides the pictures, which may be seen at any time, was a display of the Mansion House gold plate, with such priceless treasures as the Saxon City Sceptre, the City Purse (a much-worn net purse, the size of which brought home to one the comparison between the City's financial problems then and now) and the sword of honour presented to Lord Nelson, objects which only the fortunate few may see on occasions such as this. When the move to the supper room was made it was a pleasure to visitors from India to see an old friend Colonel R. J. Blackham, as Chairman of the Reception Committee, looking older but still hale and hearty, in full uniform, heading the procession and wielding a mighty stick of office in a manner worthy of a Guards' drum major.

The proceedings next day culminated in the Centenary Banquet at the Albert Hall, at which over 2,000 sat down. It seemed impossible that a good dinner could be served on such a vast scale in a place where ordinarily there are no catering arrangements, but it was undertaken by one of the West End hotels and so admirably carried through that only the most hypercritical could have found fault with the dinner served. The floor of the hall was arranged as for the President's reception and was filled with tables which overflowed into the boxes. The seating of the guests was carefully planned to mingle different parts of the Empire at the same table, the opportunity of comparing notes with medical men from distant countries adding greatly to the interest. The strains of the National Anthem on the organ announced the arrival of H. R. H. the Prince of Wales, and the big crescentic high table filled with people whose names appeared on the programme and whose coats glittered with what the present generation irreverently calls 'gongs', seated behind huge blocks of ice, many more of which would have been welcome as the evening advanced. The speeches were of a high order of excellence particularly those of the Prince and of the Home Secretary, which made us all glow with pride at being members of a profession which everyone seemed to unite to praise, so that we forgot for a time the glimpses into a life of unremitting toil scantily rewarded, which the Representative Meeting had occasionally furnished.

On the last day a ball given by the Metropolitan Counties Branch, with Mr. and Mrs. Souttar as the hosts brought the proceedings to a close. This was one of the gayest of the social events, but the writer to his great regret was unable to be present, having dined sumptuously with the Practitioner and with the prospect of a very early start on a long motor drive to the North next morning, the necessity for an early night after such a strenuous week was too apparent to be resisted.

There are many other items deserving of mention, the programmes of operations arranged daily at the general and special hospitals, the demonstrations of the treatment of tuberculous hip disease, of plastic surgery by Sir Harold Gillies and of the results of radium treatment of carcinoma by Sir Cuthbert Wallace, all so attractive but so difficult to fit into a crowded day, especially as a journey out of London was sometimes necessary.

For a quiet hour, if such could be managed, there was the Pathological Museum in the Royal School of Mines, with an interesting exhibit from the Dermatological Section of the Calcutta School of Tropical Medicine, Mackie's spruce specimens, a beautiful collection of radiograms illustrating pulmonary and cerebral pathology and many other superbly mounted specimens from various schools.

Whether grave interests or gay were sought there were ample of either to fill the whole day and all who were at the Meeting will look back on it with the pleasantest recollections and with feelings of gratitude to our hosts the Metropolitan Counties Branch and of admiration for the organising ability which accomplished such triumphs.

THE FACULTY OF TROPICAL MEDICINE, BENGAL

THE students are declared to have passed
the L.T. Session 1932—

Passed

(Arranged in alphabetical order)

1. Monohari Barua, L.M.F., Private Practitioner.
2. Ahibhusan Bera, L.M.F., Private Practitioner.
3. Manindra Lal Chakravarti, L.M.F., Doctor-in-charge for Newlands Tea Estate, Jalpaiguri.
4. Dorothy Trevor Daintree, L.R.C.P., M.B.C.S., Private Practitioner.
5. Sailendra Nath Deb, L.M.F., Serving as a Doctor, Rajghat Tea Estate, Sylhet.
6. Amulya Kumar Ghosh, L.M.F., Medical Officer, Ambari Tea Estate, Jalpaiguri.
7. Monomohan Goswami, L.M.F., Private Practitioner.
8. Gurcharn Singh Jiwan Gyani, L.C.P. & S. (Bomb.), Private Practitioner.
9. Prataprai Lalji Jobanputra, L.C.P. & S. (Bomb.), Sub-Assistant Surgeon, Rajkot State.
10. Nirmal Kumar Laha, L.M.F., Private Practitioner.
11. Nanda Lal Maitra, L.M.F., Private Practitioner.
12. Jomini Mohan Mallick, L.M.F., Private Practitioner.
13. Jessie Muthiah, L.M.F., Assistant Doctor, V. L. C. M. Hospital, Rajahmundry.
14. Nimat Khan, Sub-Assistant Surgeon, Punjab, Private Practitioner.
15. Edward Gerald O'Flynn, I.M.D., Government of India.
16. Mukundraj Ganpat Pandit, L.C.P. & S. (Bomb.), Second Assistant Superintendent, Vaccine Institute, Belgaum.
17. Nityahari Roy, L.M.F., House Surgeon, Chittaranjan Hospital, Calcutta.
18. Somalal Jagjivandas Saraiya, L.C.P. & S., In-charge of Shrimat Drupad Kublarba Dispensary, Piplod, Baria State.
19. Madhusudan Sen, L.M.F., Laboratory Assistant, Mitford Hospital, Dacca.
20. Sib Chandra Sengupta, L.M.F., Resident Medical Officer, Hope Tea Estate, Jalpaiguri, Doonars.
21. Thounaojam Tonsena Singh, L.M.F., Medical Officer, Manipur State.
22. Gian Chand Varma, M.B.B.S., Private Practitioner.

THE INTERNATIONAL SOCIETY OF MICROBIOLOGY

(A note on its constitution and present status)
The International Society of Microbiology was established in 1930 with the object of promoting scientific thought by creating a closer relationship between scientific workers in different countries, and especially of spreading the idea that all its members are united in a common ideal of peace and constant friendship. The Society is interested in all microbiological sciences (medical, agricultural, botanical), bacteriology, immunology, parasitology, and zymology.
An International Congress of Microbiology is held every 3 years. A general meeting is held at the end

of each Congress. The permanent office of the Society is in Brussels.

The Society is directed by a Central International Committee and a permanent Commission. The central committee is composed of the members of the Society's board, of the members of the permanent commission and the chairmen of the national committees.

The members of the International Society are to form, in their respective countries, either a national committee or sectional committees, who in turn elect a national committee. The national committees so constituted form a relationship with the societies of microbiology existing in these countries and the International Society of Microbiology.

The members of the International Society are elected by the office of the central committee, after proposal by the national committees. These proposals are transmitted to one of the three general secretaries of the central committee. Any person who wishes, therefore, to join the International Society of Microbiology must first address an application to the national committee of his country.

The official languages used in the congresses are English, French and German. The different subjects treated at the Congress are reports, communications and demonstrations.

The President, together with the central committee, determines upon the nature and the number of the scientific problems which are treated in the reports and chooses the rapporteurs. They also decide upon the duration of the Congress, which is ordinarily 5 days.

The communications must treat the subjects decided upon for the reports. Published papers will not be accepted. The writers of reports and communications shall address to the secretary of the board of the Congress a résumé of these reports and communications. These texts will have to be in the hands of the secretary of the board of the Congress 3 months before the opening of the Congress in case of reports and 2 months in case of communications. The writers of reports and communications are requested not to use any historical or literary introductions and to report only on new work. The time allowed to authors will not exceed 30 minutes for reports, 10 minutes for communications and 5 minutes for discussions. Those taking part in the discussion will have to send to the secretary a summary of their statements on the day following them.

The first International Congress was held in Paris from 20th–25th July, 1930, under the presidency of Professor Jules Bordet. The following countries, who had formed national committees in their respective countries, were represented:—Germany, North America, England, Argentine, Austria, Belgium, Brazil, Bulgaria, Chili, China, Denmark, Spain, France, Greece, Holland, Hungary, Italy, Japan, India, Norway, Poland, Portugal, Roumania, Sweden, Switzerland, Czecho-Slovakia, U. R. S. S., Yugo-Slavia.

The second Congress will be held in Berlin in 1933. Geheimer Hofrat Professor Hahn, Director of the Hygiene Institute of the Berlin University, has been elected as the President. The following gentlemen are working as General Secretaries:—

1. Dr. R. Dujarric de la Riviere, of the Pasteur Institute, Paris.
2. Professor Gildemeister, Reichsgesundheitsamt, Berlin—Dahlem.
3. Dr. Harry Plotz, Pasteur Institute, Paris.

The Treasurer of the Society is Mr. Georges Masson, Editeur, 120, Boulevard St. German, Paris (VIe).

The general meeting which took place on the occasion of the first International Congress of Microbiology fixed the entrance fee at 20 gold francs (100 paper francs, 4 dollars or its equivalent in the various currencies). This sum is to be sent to the treasurer of the Society, Mr. Georges Masson, Editor, 120, Boulevard St. Germain, Paris, but only after receipt of notification by the central committee that the person in question has been nominated a member of the International

Society of Microbiology. The fee for the membership of the Indian national committee is Rs. 6 only a year.

The following is a provisional list of subjects selected for discussion at the second International Congress to be held at Berlin in 1933:—

1. Susceptibility to tuberculosis.
2. Tularemia.
3. Spotted fever and related diseases.
4. Significance of tissue cultures for microbiology.
5. The use of carbohydrates as antigens.
6. A subject from the biochemistry of bacteria (to be shortly announced).
7. Helminthic research.
8. Symbiosis (for medical men and naturalists).
9. Parasitism among the higher plants.

The present Indian committee is composed of the following workers:—

President:—Dr. U. N. Brahmachari, M.A., M.D., Ph.D.

Members:—

1. Colonel R. Row, M.D. (Lond.), D.Sc. (Lond.), O.B.E.
2. Major G. Shanks, M.D., I.M.S.
3. Mr. V. Krishnamurti, C.M.V.C., I.V.S.
4. Dr. R. Khanolkar, B.Sc., M.D. (Lond.).
5. Dr. H. Ghosh, M.A.
6. Dr. A. C. Ukil, Secretary.

Any further information will be gladly furnished on request by Dr. A. C. Ukil, Secretary, Indian Committee of the International Microbiological Society, 82/3, Cornwallis Street, Calcutta.

BIOCHEMICAL AND ALLIED RESEARCH IN INDIA IN 1931

A SMALL brochure of 42 pages has been published by the Society of Biological Chemists (India) from the Indian Institute of Science, Bangalore. Presumably the publication is to be an annual one, and the annual subscription is Rs. 2.

The reviews cover a very great deal of ground, including general biochemistry, enzyme action, agricultural and dairy chemistry, general microbiology, pharmaceutical and medicinal chemistry, animal physiological chemistry, the chemistry of nutrition and a big section on animal parasitology. Almost all the papers reviewed have been published in Indian journals, and the brochure should prove very useful to workers anxious to look up such publications.

INDIAN MEDICAL ASSOCIATION MEETING

Head Office:
67, Dharamtala Street,
Calcutta,
21st October, 1932.

DEAR SIR,—I have pleasure in informing you that the invitation of the Lucknow Medical Association to hold the next IX All-India Medical Conference has been accepted and the Conference will be held at Lucknow during the Christmas week, the exact dates of the Conference will be announced later on. I have been authorised to extend the invitation on behalf of the Reception Committee formed at Lucknow to all the members of your Association and also through you to all medical practitioners in your parts. Rai Bahadur Dr. B. N. Vyas of Lucknow has been elected Chairman of the Reception Committee. Major M. G. Naidu has been nominated President of the Association for the ensuing year.

In order to make the Conference at Lucknow thoroughly representative of the medical profession of India, as in the case of the previous conferences, it is necessary that the co-operation of the members of the various associations should be freely given to our Lucknow colleagues in the successful organisation of the Conference. As on previous occasions this Conference will consider many important problems affecting the vital interests of the medical profession of India and notably the *Indian Medical Council Bill*.

There will also be a Scientific Section where scientific papers and discussion on interesting case notes will take

place. Our Lucknow friends count on the help received from the members of the different associations in this matter, and I hope that those members who are desirous of taking part in the scientific section should be requested to send a synopsis of the paper which they intend to read either to the undersigned at the above address or to the Secretary, Reception Committee, IX All-India Medical Conference, Lucknow, by the 15th of November*. It should be noted that the papers read at the Scientific Section of the Conference will be published in the official journal of the Indian Medical Association and cannot be published in any other paper without the sanction of the journal committee.

Owing to shortness of time it has not been possible to extend the invitation individually to members of the profession all over India. I am, therefore, approaching you for help in this connection and shall be obliged if you could give as much publicity regarding this Conference as possible through your local papers or otherwise so that a large number of delegates may attend the Conference to guide its deliberations and take part in the Scientific Section. The delegation fee has been fixed at Rs. 5.

* This letter was received on 24th October. It was quite impossible for us to insert any fresh matter in our November number at that date, as it was in an advanced stage of preparation.

May we again urge on secretaries of medical societies the necessity for sending out notices, such as this, in good time.—EDITOR, I. M. G.

The reception committee are making every effort to provide accommodation for the intending delegates in a suitable bungalow at Lucknow and only the actual boarding expenses will be charged. Delegates who intend to attend the Conference are requested to communicate with Dr. T. R. Swarup, Secretary, Lucknow Medical Association, Lall Bagh Circus, Lucknow, for accommodation, etc. Further particulars will be supplied on request by the reception committee.

It is anticipated that the consideration of the Indian Medical Council Bill, which has been introduced at the Legislative Assembly and referred to a Select Committee, will not be taken up at the special session at Delhi in November. It would therefore be all the more essential that the Lucknow Conference should pass resolutions regarding this Bill supporting the demands of the Indian Medical Association on the different clauses of the Bill and it would therefore be desirable that the Lucknow Conference should be attended by as many delegates as possible from the different provinces of India. It is hardly necessary for me to dilate on the importance of the Conference which besides focussing the attention on all the important problems concerning the welfare of the medical profession, affords an excellent opportunity of social intercourse between the different members of the medical profession in India.

Yours faithfully,
K. S. RAY,
Jt. Hon. Secretary,
Indian Medical Association.

Current Topics

Three Cases of 'Tropical Typhus' occurring in Bangalore, India

By J. BIGGAM,

MAJOR, R.A.M.C.

(Abstracted from the *Journal of the Royal Army Medical Corps*, No. 2, August, 1932, Vol. LIX, p. 96)

Introduction

DURING recent years, a group of typhus-like fevers occurring both in tropical and in temperate climates has attracted widespread attention. The members of the group, though differing in certain points, bear a strong resemblance to each other and all of them seem to be closely related to typhus exanthematicus.

General notes on the cases

The three cases under review presented rather varying features.

(1) In all three repeated blood films showed no malaria parasites. Total and differential blood counts were not particularly enlightening, there being no definite leucocytosis or leucopenia. In one case, however, there was a definite relative lymphocytosis. Serologically it was found in the two later cases that there was a definite rise in the agglutinins for *B. typhosus*, para A, and para B, as noted by other observers.

As regards the Weil-Felix reaction, this was negative in the first case. Three tests were done, the last on the eighteenth day of the disease. In the case of F, the first test was negative (seventh day); on the twelfth day agglutinins were present for Kingsbury (1/125) and Muktesar (1/25), on the twentieth day the titre had sunk for Kingsbury to 1/50. In the case of J, the Weil-Felix reaction was negative on the seventh day; on the tenth day agglutinin titre for Kingsbury, Warsaw, and Muktesar was 1/250, but on the seventeenth day, save for Kingsbury (1/50), the reaction was negative, and completely negative on the 24th day.

These findings are at variance with previous observations, in which the tendency was for this reaction to be positive after the fever had subsided and convalescence had been established.

(2) The rise in titre for *B. typhosus*, para A and para B, in the cases of F and J might suggest the possibility of these being cases of enterica. Apart from the sterile blood cultures, they were clinically entirely unlike fevers of the typhoid group. The acute type of onset with dengue-like pains, the time of appearance and character of the rash, the absence of even abdominal uneasiness, the feeling of well-being as soon as the muscular and joint pains had ceased, and the rapid convalescence presented a clinical picture quite unlike typhoid or paratyphoid fever.

(3) As in two (I. and F.) of the three cases the infection was likely to have been acquired in, or within a radius of twenty miles of, Bangalore, it might be of interest to mention that during the season, November to March inclusive, several medical officers have been regularly shooting over areas of scrub and uncultivated land within a radius of forty miles from Bangalore. None of them, however, has at any time either seen ticks or suffered from their bites, nor have they on return from shooting suffered from any skin lesion or irritation, which would have suggested an arthropod bite acquired in this open country.

Conclusion

It is evident that these typhus-like fevers in India are of more importance and probably much more common than was at first realized. Comparatively few cases, so far, have been reported from southern and western India, but several cases have recently been reported from the Deccan and Poona areas, and the three cases now reported occurred in a comparatively small British garrison within one year.

The diagnosis, once suspicion of the nature of the disease is aroused, is easy; but to one unaccustomed to dealing with the typhus group of fevers the cases may be puzzling.

The Early Diagnosis and Treatment of Pregnancy Toxæmia

By NORMAN WHITE, F.M.C.S.

(From the *Practitioner*, Vol. CXXIX, No. 3, Sept. 1932, p. 367)

THE toxæmias of pregnancy may be divided into two main groups: (1) comprising albuminuric toxæmia, pre-eclampsia, and eclampsia; and (2) hyperemesis. The term albuminuric toxæmia draws attention to the fact that in this type the chief damage in early cases is renal; but the stress laid on the urinary abnormality has led to the neglect of other signs and symptoms, which sometimes enable toxæmia to be diagnosed before albuminuria has occurred, and which are of more assistance in estimating progress and prognosis. In both eclampsia and toxic hyperemesis degenerative changes are found in the liver, and the changes found differ in the two diseases. Albuminuric toxæmia may progress through pre-eclampsia to eclampsia, further stages of the same disease. Hyperemesis appears to be a distinct entity.

ALBUMINURIC TOXÆMIA

This is generally considered to occur in from 3 to 5 per cent. of women who were apparently normal before pregnancy; and one of the important objects of ante-natal care is its early detection and treatment. The dangers of this pregnancy toxæmia can be grouped under three headings: (1) eclampsia; (2) permanent renal damage; (3) death of the fetus. From these we can select the mortality from eclampsia as a test by which to measure the ante-natal work which is being done throughout the country. Examination of the Registrar General's reports shows the death-rate, per 1,000 births, from 'puerperal albuminuria and convulsions' has not decreased; in the last ten years the mortality has, in fact, slightly increased. Since there has been a great increase in the number of ante-natal clinics, and the amount of ante-natal care, in the same period, it is evident that toxæmia is not being diagnosed early enough to prevent eclampsia.

The Maternal Mortality Committee in its interim report expressed the opinion that: 'Apart from the cases of fulminating eclampsia which may occasionally occur either before or after delivery within a short time after a normal blood pressure reading and urine test, eclampsia is almost entirely a preventable disease'. I have examined the case sheets of eighteen recent cases of eclampsia in order to find out how many could have been prevented. The series consists of consecutive cases admitted to hospital at the request of a general practitioner or from the hospital maternity district. In eight cases symptoms of toxæmia began one month or more, and in seven cases one or two weeks before the onset of fits. In three cases the onset was rapid and the patient was probably normal two or three days before the fits occurred. There was no case of true fulminating eclampsia of the type referred to by the Maternal Mortality Committee. Fifteen of the patients could have been diagnosed as toxæmic, by efficient ante-natal supervision. In the other three cases eclampsia might possibly have been prevented if the patient had come for examination when she began to feel ill, and if immediate treatment had been undertaken.

Symptoms of toxæmia.—These may be divided into two groups: (1) early symptoms of mild toxæmia, increasing very gradually in severity; (2) pre-eclamptic symptoms, the onset of which precedes the fits by only a few hours, or at most a few days. In order to prevent eclampsia the toxæmia must be detected in the first stage, in the second stage it may not be possible to start treatment soon enough, unless the patient is already in hospital. The first stage of the toxæmia is also important from the point of view of prevention of chronic nephritis and intra-uterine death of the fetus. A prolonged toxæmia is more likely to produce permanent renal damage than is eclampsia of very rapid

onset; and the fetus may be killed by a toxæmia in which the mother was never threatened with eclampsia.

Œdema is the most important early symptom. In cases of severe toxæmia it is common to find that there is a long history of œdema preceding the more severe symptoms which finally drew attention to the disease. Among the eighteen cases mentioned above I find that œdema was present at the onset of symptoms in thirteen, and preceded all other symptoms in nine of these. It is absent only when the onset of toxæmia is rapid. The œdema probably starts in the feet and legs and is then too often regarded as almost physiological, due to pressure by the enlarging uterus. Definite œdema of the legs, in spite of its apparent postural origin, may be due to toxæmia and the patient should be seen frequently, and a careful watch should be kept for albuminuria and rise of blood pressure. Generalized œdema, shown by swelling of the face and hands, is a more definite sign of toxæmia. It is important even when only of slight degree, and is usually a symptom complained of by the patient, rather than a sign noticed by the practitioner. The most important type of œdema is that which gradually spreads up the thighs and on to the abdominal wall; at the same time slight swelling will usually be noticed in the hands and face. This spreading œdema is a common sign of the pre-eclamptic state. I have noticed it especially in toxæmic patients during labour. Such patients require careful treatment to prevent intra-partum and post-partum eclampsia.

Headache is a later symptom. If it is due to toxæmia it does not precede the development of albuminuria and the rise of blood pressure by more than about two weeks as a rule. Patients who have had headaches longer than this usually admit, when carefully questioned, that they have had them throughout pregnancy or longer, and the headache can then be classed as migrainous. **Visual disturbances** are also a late sign. I do not find 'spots in front of the eyes' or 'flashes of light' of much value as a sign of mild toxæmia, but disturbances of vision are very important in pre-eclampsia. Partial or complete blindness very commonly comes on an hour or two before the first fit, and calls for immediate drastic treatment of the toxæmia, if eclampsia is to be prevented. The rapid onset of severe headache has a similar significance, and epigastric pain, in conjunction with other symptoms or signs, often precedes convulsions.

Physical signs of toxæmia.—Œdema has been included among symptoms because it begins gradually and, especially on the face and hands, may be more obvious to the patient than to the practitioner. There is no doubt that rise of blood pressure is the most important sign of toxæmia. Attention has recently been drawn to its importance by Professor F. J. Browne. He found that rise in blood pressure preceded albuminuria in 13 cases out of 48, by periods ranging from 11 to 89 days. In the other 35 patients albuminuria and rise of blood pressure were discovered at the same time. Routine blood pressure estimations should be made at intervals throughout pregnancy and the results interpreted in relation to the symptoms and other signs. Browne recommended that the patient should be seen every month till the thirteenth week, then fortnightly till the thirty-sixth week, and weekly after that till delivery. This may seem too much to ask, but it is only by routine examination in all cases that we can hope to detect early toxæmia. If the blood pressure cannot be taken as a routine, it should at least be taken when there are any symptoms which may be toxæmic; and if albuminuria is present, the degree of rise in blood pressure gives a valuable indication of the severity of the disease.

Any rise in blood pressure over 140 mm. Hg. should be regarded as probably toxæmic in origin. In patients of 35 years of age or more such a blood pressure may be normal, but this can be decided only by correlation with the other signs and symptoms, and by seeing the patient weekly for a time, if no indication is found for urgent treatment. A rise of blood pressure to 160 mm.

Hg. or more, especially if it has occurred in a short time, is an urgent indication for treatment.

Albuminuria occasionally occurs as the first sign; but this is very uncommon in a true pregnancy toxæmia. It is more likely to occur early in chronic nephritis, and may then of course have been present before pregnancy. In pre-eclampsia the amount of albumen in the urine rapidly increases.

It must be emphasized that all symptoms and signs must be taken into account in deciding whether toxæmia is present, and what treatment shall be given. A slight rise of blood pressure combined with moderate oedema and headache, or one of these and slight albuminuria, is of much more significance than a symptomless rise of blood pressure of greater degree. A patient is sometimes found to have a blood pressure of 160 mm. Hg. or more, and may go through pregnancy and labour successfully, never showing any other abnormality. She must then be regarded as a case of hyperpiesis with no toxæmia or nephritis. On the other hand, a patient may have eclamptic fits with a blood pressure of only 155 mm. Hg. A single symptom or sign occurring alone is an indication for investigation and observation, but does not usually require much treatment.

Ante-partum hæmorrhage is an occasional consequence of toxæmia, and may be included among the symptoms and signs. It is usually associated with extensive placental infarction which ultimately causes the death of the fœtus. It has been noted in eclampsia, but as a rule a toxæmia which leads to ante-partum hæmorrhage does not cause eclampsia.

Chronic nephritis is sometimes included in a discussion of pregnancy toxæmia. Definite nephritis with cardio-vascular changes and signs of renal deficiency, which were known to be present before pregnancy, is an indication for immediate termination of pregnancy. Recurrent toxæmia may possibly be due to a slight degree of renal damage which only shows under the strain of pregnancy. This can only be proved by continued observation after pregnancy has terminated; slight degrees of nephritis are difficult to diagnose during pregnancy and doubtful cases should be treated as pregnancy toxæmia.

Treatment.—The origin and nature of the toxin responsible for this disease are unknown. We can terminate the toxæmia by terminating the pregnancy, but there is usually no abnormality in the ovum which can be regarded as a cause of toxæmia. There is very little evidence in favour of alimentary toxæmia as a primary cause, and it is difficult to believe that a condition peculiar to pregnancy can be due to alimentary disturbance. We know, however, that in early cases the main damage done by the toxin is renal. Treatment must therefore endeavour to diminish the work done by the kidney, in order to give it every chance to deal with the toxin; and pregnancy must be terminated before the kidney suffers permanent damage, and before the toxin has killed the fœtus, or injured the liver.

Rest in bed is the most important part of all methods of treatment. A mild toxæmia may clear up with complete rest in bed, and very little treatment beyond that. More severe toxæmias usually show a temporary improvement only. Chronic nephritis may develop after mild toxæmia or the mild toxæmia may develop into severe toxæmia which can only be terminated by emptying the uterus. All mild cases must therefore be treated by complete rest at a time when treatment has its greatest effect. The patient must stay in bed till the signs of toxæmia disappear, and the blood pressure and urine are normal. This does not commonly occur before delivery, except when treatment is undertaken in the very early stages; therefore, most patients with definite toxæmia of pregnancy must stay in bed till delivery.

Diet is usually considered to be of equal importance with rest but it is difficult to be certain whether it has such a great effect on the progress of the patient. The diet may be restricted (1) to give rest to the kidney, (2) to prevent the production of a hypothetical toxin

in the alimentary canal, (3) to decrease the production of acid, and increase the production of alkaline substances in the body, (4) to decrease the ingestion of salts. The first reason is definitely founded on the fact that the kidney suffers first and most severely in toxæmias which do not progress as far as eclampsia. The second reason is theoretical, but a diet which satisfies the first reason will also probably eliminate the foods supposed to produce the toxin. The third reason depends on the researches of Osman and Close who found that an alkali-producing diet and administration of large quantities of alkalis produced improvement in cases of albuminuric toxæmia of pregnancy; similar treatment having already been found to decrease the incidence of nephritis in scarlet fever. Both types of diet are essentially low-protein diets. The patient should not take meat, fish, eggs, or meat extracts. Bread and cereals generally, should be taken sparingly. She may have two pints of milk daily, with milk puddings and potatoes. Fruit, stewed or raw, and salads may be taken and are beneficial because they increase the volume of the food. The patient should be encouraged to drink large quantities of fluids, water, lemonade, or barley water. Lemonade made with glucose is the best drink, because its caloric value is high. If the diet is kept too low she may be living on her own tissues. Cocoa and weak coffee or tea may be taken in small quantity, and the total amount of fluid should be 4 or 5 pints daily. Sugar also tends to counteract the acidosis which is a danger whenever diet is restricted.

It may not be found possible to keep a patient on such a low diet for longer than about ten days. If improvement takes place, a small amount of fish and an egg may be added; but meat must be avoided for the rest of pregnancy even if the toxæmia clears up completely.

Elimination of the toxin is the theoretical object of some forms of treatment. Whether it achieves this object or not, diuresis is to be encouraged by the administration of large amounts of fluid, because it certainly appears to lead to improvement, and to diminution of the toxæmia. Diaphoresis may be encouraged by hot-water bottles and blankets, but it is doubtful whether any good results from increased sweating. The patient should, however, be kept warm; and in the more severe toxæmias it is better that she should lie between blankets. Purgatives should also be given, in order to produce one or two motions daily. Magnesium or sodium sulphate in doses of one to three drachms daily are the most satisfactory.

Drugs are of very little use in treatment. Alkalis may be given, as in Osman and Close's treatment of nephritis. Potassium citrate and sodium bicarbonate are given two or four hourly, in doses up to a total of 400 grains daily or sometimes more, the object being to keep the urine continually alkaline. If this treatment is to be any good it requires frequent determinations of the exact degree of alkalinity of the urine. In favourable cases diuresis takes place and toxæmia diminishes, but it is too soon to give any final opinion on this treatment.

In the presence of more severe toxæmia, as shown by a blood pressure of 160 mm. Hg. or over, and symptoms of pre-eclampsia, the treatment must be more drastic than that which has just been described. No solid food should be given by the mouth, but glucose lemonade and barley water should be taken freely. If the blood pressure rises and symptoms increase in severity the pregnancy must be terminated at once.

Duration of conservative treatment.—It is now generally accepted that albuminuric toxæmia is likely to lead to permanent renal damage if it is allowed to continue longer than about two weeks. This period is a reasonable test of the treatment, and pregnancy should be terminated if the patient shows no improvement at the end of that time. If improvement is occurring the period of conservative treatment may be extended if the fœtus is small, but there is little to be gained

by prolonged dietetic treatment when the pregnancy has reached 36 weeks. During treatment a careful watch must be kept for increase of headache, visual disturbances, and oedema; and the blood pressure must be taken twice daily, because it is the safest guide to the patient's condition. A blood pressure remaining at 160 mm. Hg. or over, in spite of treatment for three or four days and a blood pressure rising above this level in spite of treatment are indications for immediate termination of pregnancy. Patients with persistent symptomless high-tension, and no albuminuria, must be carefully distinguished from those where the rise of blood pressure is due to toxæmia. In the presence of severe toxæmia delay is of no advantage to the fetus, which is more likely to die *in utero* from toxæmia than after birth from prematurity.

Termination of pregnancy.—The two methods most commonly used are bougie induction, and rupture of the membranes. If labour does not come on castor oil may be given, and an enema, as in an ordinary drug induction, and supplemented by hourly injections of pitocin in two-unit doses up to a total of ten units. When pains come on it is dangerous to continue giving pitocin. Pituitrin should not be used because it raises the blood pressure. Drug induction without previous instrumental induction is useless unless the patient is at or near term, when it may be tried before resorting to bougie induction. The fetal mortality during labour is high because the placenta often contains infarcts before labour, and the fetus dies of asphyxia before delivery. Cæsarean section may therefore be considered when the mother is elderly, and when a previous fetus has been lost from toxæmia and the mother has no living child. If chronic nephritis is diagnosed Cæsarean section is the best method because sterilization is indicated. In pregnancy toxæmia there is no indication for sterilization.

Following delivery the patient should be advised not to become pregnant for at least two years, in order that the kidney may have opportunity for complete recovery. There will then be less likelihood of a recurrent toxæmia, and renal function tests can be performed to exclude the possibility of nephritis, before the next pregnancy.

HYPEREMESIS GRAVIDARUM

There is a rare disease compared with the albuminuric toxæmia which has been dealt with in preceding pages.

It is commonly divided into neurotic and toxic types, but it seems probable that the one really develops into the other; and it is possible that the 'normal' early morning vomiting of pregnancy may be toxic in origin. True toxic hyperemesis is a very serious and fatal condition, in which termination of the pregnancy is nearly always necessary. Its progress is so insidious that the decision to empty the uterus may not be made early enough to save the patient's life. It usually occurs between the second and fifth months of pregnancy, and begins with morning vomiting, which gradually becomes more severe till the patient cannot keep any food down. The first definite indication that the condition is toxic will be failure of nutrition—the patient becomes thinner. At the same time there is a diminution in the output of urine; this is the first evidence of dehydration. The vomiting may not appear severe, but the condition of the patient gradually deteriorates. Her complexion alters and jaundice appears; bile may be found in the urine. In the last stages of the disease the pulse rate rises, and albumen is found in the urine. The blood pressure is usually low throughout.

The patient should be treated by isolation and starvation to a degree which depends on the severity of the disease. In definitely toxic cases it is necessary to stop all feeding by the mouth, and give enemata, or continuous rectal saline, containing 5 per cent. glucose. Glucose solution may also be given intravenously. Bromides may be added to the enemata. After twenty-four to forty-eight hours a little water may be given by the mouth, and the patient may eat small portions of lettuce or fruit. The output of urine, the intake of fluids, and the amount vomited must be measured daily. If the urinary output remains small, and the clinical condition of the patient does not improve, therapeutic abortion must be carried out, even if very little vomiting is occurring. The most useful signs of toxæmia are diminished output of urine, the presence of bile in the urine, and jaundice. Albuminuria often occurs too late to be of any value in diagnosis. Abdominal hysterotomy is the best method by which to terminate pregnancy; induction is too slow, and vaginal hysterotomy may cause profuse bleeding and shock. If pregnancy is terminated too late, the toxæmia may continue, and the patient may die a week or more after the uterus has been emptied.

Reviews

ANTONY VAN LEEUWENHOEK AND HIS 'LITTLE ANIMALS'.—By Clifford Dobell, F.R.S. London: John Bale, Sons & Danielsson, 1932. Pp. 435, with 32 plates. Price, 31s. 6d.

WRITTEN by the most eminent protistologist of to-day, this story of the 'Father of Protozoology and Bacteriology' is a most wonderful and fascinating book. Its great merit is that it is no mere presentation of a translation of some of Leeuwenhoek's famous letters, but a presentation of Leeuwenhoek, the man, himself, with all his charm and naïveté; his personality shines out from its pages as clearly as in the exquisite portraits with which the volume is embellished. 'This old Hollander', writes Dobell (in a previous article), 'was, in truth, one of the most original men who ever lived. It is impossible to compare him with anybody else, for he belongs to a genus of which he is the type and only species. Your typical scientific genius gets a good education; Leeuwenhoek got practically none. He goes to a university and studies under distinguished professors; not so Leeuwenhoek. He imbibes the traditional knowledge of centuries and then begins to rearrange and develop it for himself; but all that Leeuwenhoek knows he has learnt himself from Nature, and when he sets

to work he relies entirely upon his own native genius. He cannot even read what others have written on the subjects that interest him. He can only talk to Nature, ask her questions in 17th-century Dutch and puzzle out her answers by himself'.

Mr. Dobell commences with a most charming author's epistle to the reader 'introducing Mynheer Antony van Leeuwenhoek of Delft in Holland, Fellow of the Royal Society of London in England'. This is written in the author's characteristic and somewhat pungent style. As a young man of 20, Mr. Dobell commenced to study the microscopic creatures in organic infusions, only to discover that these 'little animals' had originally been observed more than two centuries before by somebody called, more or less, Leeuwenhoek. 'More or less', because his name has been spelt and misspelt in a great variety of ways. The author's studies next led him to study the protozoa living inside frogs; to his astonishment he found that the earliest observations on these organisms had been made by the same person—Leeuwenhoek. He next turned to the study of the bacteria and spirochaetes of the mouth; here again he found to his amazement that all these organisms had first been seen and described by Leeuwenhoek. Later,

made a tremendous stir in the clear medium. He quite clearly differentiates between living micro-organisms and the oscillatory movement of minute non-living particles in a fluid medium—though 'Brownian movement' was not 'discovered' until a century and a half later. Spirochaetes and motile bacteria in the stools are also described. It is to be noted that, although he found entozoic protozoa and bacteria in the faeces, yet he does not ascribe any pathogenic rôle to them. Having had no medical education, and not being prejudiced on the subject, he rightly regarded these micro-organisms as non-pathogenic. 'He deserves every credit for not speculating in excess of his facts', writes Mr. Dobell. 'If every worker on the same subjects during the next 250 years had possessed an equally conservative and scientific spirit, a great deal of unnecessary confusion in our knowledge of "microbes" might have been avoided'.

In letter 38 dated 1683 come his well-known observations on the intestinal protozoa of frogs and other animals. Here he accurately describes for the first time the blood corpuscles and spermatozoa of frogs. Also in the intestinal contents of frogs he discovered and drew *Opalina*, *Nyctotherus*, and *Trichomonas* (*Trichomastix*). In letter 39, a very famous one, he deals with the micro-organisms of the mouth, having made an exhaustive study of his own saliva, of the tartar on his teeth, that on the teeth of his own womenfolk, of an 'old man who leads a very sober life, and never drinks brandy or tobacco', and of another old man addicted to 'continual boozing'. Here there are clearly described and illustrated bacteria, spirochaetes and a *Leptothrix* from the human mouth.

Chapter 4 deals with Leeuwenhoek's later observations on free-living protozoa, made after he was 70 years of age. Here eight letters are concerned. There is a very clear description and drawing of *Volvax*, of the shell of a Foraminiferan (*Polystomella*?) discovered in the stomach of a shrimp, and of *Hæmatococcus*, *Chlamydomonas*, and *Coleps* from reddish rain water from a roof gutter. Further, he gives the first account of the ciliates ectoparasitic on *Hydra*, and in the letter on duckweed at least five different ciliate protozoa are described—*Vorticella*, *Carchesium*, *Cothurnia*, *Trichodina*, and *Kerona*, whilst a further letter describes the discovery of a colonial flagellate (*Anthophysa vegetans*, one of the 'iron-protozoa'). He compares the tree-like growth of such colonies to the chemically produced trees obtained by dropping a particle of copper into a solution of metallic silver in dilute nitric acid. In a still later letter he describes *Polytoma* and its method of reproduction by division of the parent body into 4, then into 8, and the bursting of the enclosing membrane to liberate the daughter individuals.

In the next part of the book there follow elucidations on Leeuwenhoek's name, the language in which he wrote, an account of his microscopes and microscopical methods, of the draughtsmen whom he employed, of his seals and other annotations. Naturally, he was very much worried in the matter of measurement of his 'little animals' since no micrometric scale existed. He took the inch (of his land and period) as his absolute unit for small measurements, and used a copper rule with the inches subdivided into tenths. Also as standards of measurement he used sand grains, human red blood corpuscles, the vinegar eel, a millet seed, the thickness of the hairs in his own wig, the eye of a louse, and the 'hair' on a louse. His sections of plants and animals were cut by hand with a sharp razor, and attached to a page of one of the earlier letters is a little packet of these sections containing sections of cork, parings from a quill, sections of the optic nerve of a cow, and of elder pith. One difficulty is to understand how Leeuwenhoek obtained the necessary illumination on the very minute objects studied with lenses of such short focal range. Mr. Dobell thinks that he must have used some form of dark ground illumination. Most of his illustrations appear to have been carried out by

Thomas van der Wilt, a citizen of Delft, and by his son Willem.

In the *Envoy*, pp. 362—387, the author discusses Leeuwenhoek's place in protozoology and bacteriology. 'Leeuwenhoek will be finally judged by his own writings', writes Mr. Dobell, 'and not by anything that other people say he wrote. He has left us a great mass of records—both published and unpublished—from which we can now extract what we please. I have endeavoured to recover from them all his observations on the Protozoa and Bacteria, and to set in order his inchoate and uncorrelated findings in a manner which may fairly convey their import and importance to present-day students. To me his words, when judiciously weighed in the scales of contemporary and recent knowledge, prove conclusively that he was the first protozoologist and the first bacteriologist..... He was the originator of everything we now know about "microbes", and of all that will ever be known about these organisms..... I have always endeavoured to regard Leeuwenhoek objectively and dispassionately, but I am conscious that I have not always succeeded; for whenever I listen to his talk about "little animals" I am carried away by the unintentional eloquence of his discourse. He speaks an ungrammatical and old-fashioned language which is not my mother tongue, and which I have learned painfully and as yet imperfectly; but he also echoes a language which I hear oftener than any other, that of the "little animals" themselves. I have spent all my working life trying to understand them, but I still know no more than old Antony knew—just enough, in fact, to inspire me with the enthusiasm to continue listening and labouring, but never enough to feel satisfied with my interpretations. I have unbounded admiration for Leeuwenhoek because he heard and interpreted things that I, unaided, could never have discovered, and hit on problems—during quiet nights in his own private closet—of which neither he nor I can ever know the final solution'.

The book closes with a complete list of Leeuwenhoek's writings, a list of references and sources, and an index.

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We have devoted considerable space to Mr. Dobell's book, both because of its peculiar charm and because of its importance as a contribution to the history of medicine. The individual who purchases a copy will find it a life-long treasure. A copy should be in every medical library in India, and in every protozoological and bacteriological institution.

Finally, we should like to congratulate the publishers on the admirable style of publication of the work. With its wealth of plates and its unassuming yet almost sumptuous binding, it is a work that we think would have made a special appeal to Antony van Leeuwenhoek himself. It is written in the spirit of the motto which Boerhaave adopted:

Simplex sigillum veri

(Simplicity is the hall-mark of truth)

We could wish that more scientific research workers of to-day would but adopt it.

R. K.

A SHORT PRACTICE OF SURGERY.—By Hamilton Bailey, F.R.C.S. (Eng.), and R. J. McNeill Love, M.S. (Lond.), F.R.C.S. Vol. I. London: H. K. Lewis and Co., Ltd., 1932. Pp. viii plus 530, with 269 illustrations. Price, 20s.

THE books on systematic surgery available for the student are very numerous, and yet the authors of this work have thought it necessary to add to their number by the publication of the first volume of 'A Short Practice of Surgery'.

However much we may doubt that this book will replace the old established manuals we must express our admiration at the skill with which the authors have given an adequate description of modern surgical practice in so small a space.

The arrangement does not differ markedly from that of other and larger textbooks but the space usually given to surgical pathology is cut down to a minimum, and it is for this reason that the student could not depend entirely on this short surgery if he wishes to satisfy his examiners.

But all students will find it very useful. It is evidently the work of those who have had long experience in teaching. The essentials are all there, the illustrations are well chosen and beautifully reproduced. It is to be hoped that the second volume will appear soon, for then the medical student will have a complete work which will enable him to revise rapidly and efficiently the difficult subject of systematic surgery.

H. H.

SURGICAL PATHOLOGY OF PROSTATIC OBSTRUCTIONS.—By A. Randall, M.A., M.D. London: Baillière, Tindall and Cox, 1931. Pp. xiii plus 266, with 78 plates. Price, 37s. 6d.

The studies on which this book is based were carried out at the Philadelphia General Hospital during the space of ten years. A series of 1218 consecutive specimens of the male bladder and prostate were collected and examined. This was followed by an analysis of the collateral pathological data in each case, especially of those which showed prostatic changes. The clinical histories were next investigated and tabulated. The Philadelphia General Hospital has a capacity of over 2,000 beds, comprising ordinary hospital cases and in addition tuberculous, mental, and almshouse cases. Notes were available of 1215 cases, both whites and negro, and specimens of the most interesting prostates and bladders were preserved. In connection with this work the author makes the observation 'that progress along any line of special pathology almost uniformly comes from investigation of clinical specialists devoting part of their time to pathological research'. This is particularly true of progress in tropical medicine, where the wealth of clinical material is almost unlimited; but the fact is not sufficiently realized either in the teaching or practice of medicine in the tropics.

The purpose of the monograph is stated to be fourfold: an analysis of the material at hand under the headings of hypertrophy, median bar, carcinoma and abscess; the study of the gross morbid findings; the surgical handling of such cases; and the provision of a series of illustrations depicting the actual specimens. A comparison is made between the statistics brought forward and those of other workers in this field. Among the 1215 autopsies at all ages of life, it was found that there were 312 cases with gross pathological changes in the prostate. This represents an incidence of 25.6 per cent. of the whole series, classified by the author under the headings of:—benign prostatic hypertrophy, 222; true fibrous median bar, 57; carcinoma of the prostate, 17; prostatic abscess, 16. We are told that such lesions of the prostate as acute or chronic prostatitis, unusual growths, tuberculosis, etc., are not included in the series. This gives some idea of the importance of the subject of prostatic disease.

One of the outstanding features of the book is the collection of 78 plates. The specimens were photographed under water; they were beautifully reproduced, and a brief clinical note of the case and a description of the specimen is to be found on the opposite page. (It may be mentioned, in passing, that the first five lines of the description of plate 6 on page 44 are exceedingly difficult to follow.)

The author divides his book into six chapters. The first chapter deals with the details of the material available; the second with the important subject of benign prostatic hypertrophy, which after a general analysis is described under headings according to the anatomical type and the surgical considerations involved in each, illustrated by a description of the plates. The third, fourth and fifth chapters deal in a similar manner with median bars, carcinoma of the prostate, and abscess of the prostate. The final chapter is labelled 'Miscellaneous Studies' and deals with a variety of

questions, such as the influence of the marital state on prostatic disease, occurrence of prostatic calculi, the influence of race, etc.

Every surgeon must be familiar with the subject of prostatic disease in all its forms, and it is not always possible to refer his cases to a genito-urinary specialist. He will find in this book laid before him, with a wealth of industry and in graphic form, all the important aspects of the subject. Though there is room for differences of opinion as regards classification, surgical considerations and other matters, all who read this book will agree that the author is to be congratulated on his handsome addition to our knowledge of prostatic affections.

F. P. C.

GONORRHOEA IN THE MALE AND FEMALE.—By P. S. Pelouze, M.D. Second Edition. Revised. Philadelphia and London: W. B. Saunders Company Ltd. Pp. 440. 92 illustrations. Price, 24s.

THE first edition of this book was reviewed in these columns in 1929. It is frankly a book for the general practitioner, written in rather a diffuse style, a characteristic which is more noticeable in this new edition with several chapters added and a whole new section on the disease in the female. That the book has found its public is evident from the number of reprints of the first edition called for; perhaps it is the sun of success which is causing the author to become expansive, at the risk of spoiling the short common-sense presentation of the subject which he set out to write. For a book which is frankly a guide to treatment quite a lot of space is allotted to the pathology of the disease, with some interesting and thoughtful sections on defence mechanisms, in which the methods of differentiating between fresh infections and toxin responses arising from old infections are made clear. Another matter on which there is much confusion of ideas, which is here very clearly explained is the two-glass test. The keynote of the methods of treatment is gentleness. No strong chemicals or heavy doses of vaccines, which are liable to depress resistance, and above all no meddlesome trauma of the urethra by instrumentation until all active inflammation has died out. All with experience of these cases will agree that general adoption of such methods would lead to greatly improved results and lessened incidence of complications. A number of case-histories are given as examples of how not to treat cases, the prize must be awarded to a 'physician' who took a cotton applicator soaked in mercurochrome, and passed it several times up and down the length of the anterior urethra like a ramrod. The author wisely remarks that in approaching the treatment of the victim of such barbarity the time element had best be forgotten. There are many other examples of 'treatment' almost as bad, which are worth reading for the warnings they convey, more impressive than many pages of description of the right methods. The author's fundamental principle is that the right use of antiseptics in the urethra is to stimulate tissue reactions, not to kill gonococci, since that cannot be done by chemical means and to attempt it is to court complications. The use of the urethroscope and other special instruments is not described, perhaps wisely in a book intended for practitioners. One might have expected however to find some discussion of the indications for vasostomy, but presumably the author has no use for it, as he considers chronic seminal vesiculitis to be a rare condition, an opinion with which few will agree. The section on gonorrhoeal arthritis is brief and inadequate and that on the disease in the female, in which department the author does not claim to have any great experience, is too theoretical to be of much help to practitioners looking for directions what to do. The book can be recommended to general practitioners as a sound practical guide to the treatment of male cases, if they follow its methods they will not go far wrong and they will see few of their patients develop serious complications.

W. L. H.

A HANDBOOK OF MIDWIFERY.—By C. Berkeley, M.A., M.C., M.D. (Cantab.), F.R.C.P. (Lond.), F.R.C.S. (Eng.), F.C.O.G. Third Edition. London: Cassell and Company, Ltd., 1932. Pp. x plus 609, with colour frontispiece and 67 illustrations in the text. Price, 8s.

THIS excellent book for midwives has reached its eighth edition and covers the whole field of obstetrics together with that special information requisite for nurses sitting for the C. M. B. examinations.

It is a book we should like to see translated into many of the vernacular languages in India for the guidance of *dhais*, for its arrangement and simplicity of language are without compare. The only thing needed to enhance its utility are one or two chapters on the special diseases of pregnancy and their complications which are met with in the tropics.

V. B. G-A.

BOTTLE FEEDING OF INFANTS.—By Mrs. Henry Haldin. Third Edition. London: Simpkin Marshall, Ltd., 1932. Pp. viii plus 78. Price, 1s.

THIS little book contains some important recipes and many exhaustive tables for the preparation of artificial food for the infant and the baby. Along with these important formulæ, valuable advice on weaning a breast-fed infant has been added.

It is a useful book and will be appreciated by mothers and nurses alike.

V. B. G-A.

RECENT ADVANCES IN OBSTETRICS AND GYNÆCOLOGY.—By A. W. Bourne, M.A., M.B., B.Ch. (Camb.), F.R.C.S. (Eng.), F.C.O.G., and L. H. Williams, M.D., M.S. (Lond.), F.R.C.S. (Eng.), M.C.O.G. Third Edition. London: J. A. Churchill, 1932. Pp. x plus 418. Illustrated. Price, 12s. 6d.

EVERY teacher in India will welcome this third edition, for the authors have done signal service to our speciality.

It is by no means an easy job to sift the wheat from the chaff of the vast and ever-recurring literature of a subject like ours.

Real progress or advance can only be attested by time and results, but happily the younger school of gynæcology is imbued with the spirit of Harvey's injunction 'Study and seek out the secrets of nature by way of experiment'.

This has been done for us in the study of functional uterine hæmorrhage and the sex hormones, for undoubtedly the most interesting chapters are upon these two subjects and upon puerperal sepsis and prolapse.

Personally I was delighted to find a fully-illustrated section upon the interposition operation and Mayo's operation, for both these operations have a tremendous utility in the tropics.

For years I have been doing these operations in preference to the Fothergill operation, for in the tropics the interposition operation permanently cures the prolapse and prevents further parity. It can be completed in twenty minutes, there is no bleeding and no shock. It can be combined with amputation of the cervix and posterior colpoperineorrhaphy.

The illustrations in Dr. Bourne and Dr. Williams' book are magnificent.

This edition goes into the new work on endometrioma, and the statistics of failed forceps convince one for ever of the importance of every teacher of obstetrics being an adept in the lower uterine segment Cæsarian section operation, for the conservatism of the United Kingdom in this respect is a blemish as compared with American, Indian, and Continental obstetric surgery.

In a future edition perhaps it will be possible to write up or describe a simple operation, namely, that of ligation of the tubes *per vaginam*—a technique which is easy to learn and of enormous benefit. It can be done in fifteen minutes and means a stay of only five days

in bed. It is a means of birth control incomparably better than any other, when the necessary indications demand it.

The authors are to be congratulated on the production of a sterling volume and it is to be hoped that every teacher and professor of obstetrics and gynæcology in the tropics will acquire it and make use of the golden threads therein.

V. B. G-A.

CLINICAL ROENTGEN PATHOLOGY OF THORACIC LESIONS.—By H. Meyer, M.D. London: Henry Kimpton, 1932. Pp. 186. Illustrated with 113 engravings. Price, 25s.

THIS volume, the writer of which enjoys an international reputation, expounds the teaching of the department of Roentgenology of the New York Post-graduate Medical School. It is the first of a series dealing concisely with problems of radiology on an anatomical basis. It deals mainly with abnormalities and diseases of the respiratory tract, including all closely-related and underlying structures. It is in fact an exposition of all that may be seen in routine x-ray examinations of the thorax, with special reference to the respiratory tract.

In an effort to keep the size of the volume within reasonable limits repetition has been avoided as far as possible and references omitted.

A feature of the work is the series of black and white drawings similar to those used in blackboard illustrations. There are also reproductions of skiagrams representing the main pathological conditions described. These seem to have been from plates rather than duplicated films, as the sides are the reverse of what one sees on the fluorescent screen; this is rather a pity. Also many of the radiograms seem to have been under-exposed, and, while they may be more useful for showing details in an actual skiagram, do not lead to such brilliant pictures as one expects in a book of this kind.

On the whole we have nothing but praise for the volume which sets forth clearly and concisely all the facts associated with x-ray examination of the normal or abnormal chest.

J. A. S.

THE PHYSICAL MECHANISM OF THE HUMAN MIND.—By A. C. Douglas, M.B., Ch.B. Edinburgh: E. & S. Livingstone, 1932. Pp. xiv plus 251. Illustrated. Obtainable from Butterworth and Co. (India), Ltd., Calcutta. Price, Rs. 11-4.

THE author believes that physiology has now advanced sufficiently to warrant yet another attempt to demonstrate the physical basis of mind. Most psychologists will repudiate the author's view that, because psychology refuses to correlate its data with material processes, psychology cannot be called a 'science'. The claim of psychology to be recognised as a science has been, and still is, disputed by many biologists, chemists, and physicists. The opposition to psychology reached its culmination in the materialistic philosophy of the 19th century which held that 'psychology dealt with non-material and non-spatial processes which were 'epiphenomenal' and 'unreal' and therefore incapable of scientific treatment. This view owed its origin partly to the existing misapprehension of the real nature of science, namely, that science is not characterised by the nature of the facts with which it deals but by the method of its attack. Clearly there is nothing in this definition to exclude from the field of science mental, as opposed to material, facts, nor psychological as opposed to other conceptions. Indeed, at present science has, in general, the air of becoming less nearly exact as it mounts higher. When it reaches man's higher faculties there may be found to be a debatable ground where intellect gradually gives place to action as the only available means to understanding. Nevertheless, this book will repay careful study by all who are interested in the matter with which it professes to deal. Few will quarrel with the author's postulate

that increased potentiality of mind emerges, *pari passu*, with increased complexity of organic structure, and cannot be otherwise attained. In chapter X, entitled 'Attention, Perception', the author presents his attempt to construct a scientific synthesis from the material presented in the previous chapters. For the sake of convenience and brevity he coins the term *senglia* and applies it to denote a cortical neurone, or group of neurones, stimulation of which evokes a definite memory sensation. He maintains that perception depends upon the association of *senglia* in different parts of the cortex, the association being such that a complete perception pattern can be recalled to consciousness by stimulation of any of the constituent *senglia*, or combinations of *senglia* in any cortical area. On this hypothesis the central equivalent of a memory is the excitation through association fibres of, according to the author, integrated *senglia* sensitised by the physical stimuli which evoke the original reflexes. The author then proceeds to discuss from the same standpoint such psychological concepts as belief, reason, will, imagination, speech and symbolic thought. The author concludes with the intriguing speculation that in the ultimate constituents of critical function where, as he believes, the psycho-physiological mechanism of space-time can be supposed to exist, there may be found the psychic equivalent of *quanta*. The book is provided with superlatively excellent diagrams which help very considerably in the apprehension of the author's views which, although stated with admirable clarity, are not always easy to grasp.

O. B.-H.

HYPNOTISM, SUGGESTION AND FAITH-HEALING.

—By A. Cannon, M.D. London: William Heinemann (Medical Books), Ltd., 1932. Pp. 43. Price, 2s. 6d.

This little book is intended as a simple exposé of the theory, classification, and practice of hypnotism in simple form for the general practitioner. An introductory section is followed by brief accounts of the methods used by Bernheim, Grossmann, Liébeault, Lloyd-Tuckey, Binet and Féré, and others; also by a detailed account of the author's own method. The use of suggestion without hypnotism is also discussed.

The book should prove useful to all medical practitioners who wish for a general résumé on the subject.

ACROMEGALY.—By F. R. B. Atkinson, M.D., C.M. (Edin. Univ.). London: John Balo, Sons and Danielsson, Ltd., 1932. Pp. viii plus 260, with 3 figures. Price, 21s.

ACROMEGALY is a comparatively rare disease but has attracted the notice of clinicians all over the world on account of the peculiar features associated with it. Within recent years, the finding of an adenomatous growth in the pituitary gland in cases of acromegaly has focussed a great deal of interest around the subject. This monograph of Dr. Atkinson is therefore likely to be well received by clinicians and research workers interested in the disease.

Though very few original observations are recorded, the author has taken great pains in collecting all the information of about 1,319 cases of the disease from various sources. The subject-matter has been presented in a systematic and orderly way. A full description of the pathological anatomy, based on the records of all the autopsies to be found in the literature, is given. Results of removal of the hypophysis by various surgeons, description of the eye-conditions as recorded by the ophthalmologist, and an analysis of autopsy findings are appended at the end in a tabular form for ready reference. Professor Arthur Keith, who has done a great deal of work in connection with the skeletal changes of acromegaly and its relationship to the skulls of anthropoid apes and the paleolithic skeleton, has written a foreword to the book, in which his ideas regarding this interesting disease have found expression.

The book appears to be rather highly priced considering the number of pages and illustrations in it.

R. N. C.

ILLUSTRATED KEY TO THE FULL-GROWN LARVÆ AND ADULTS OF SOUTH AFRICAN ANOPHELINE MOSQUITOES.—By Botha de Meillon, M.Sc., F.E.S., Entomological Department, South African Institute for Medical Research, Johannesburg. Published by the South African Institute for Medical Research, P. O. Box 1038, Johannesburg, 1931. Pp. 275—375.

In his introduction the author warns workers against diagnosing mosquitoes on single characteristics. We cannot agree to this: there can be no question but that for practical field-work the diagnosis by observation of as few characters as possible is sufficient and is indeed that subconsciously utilised by the expert field-worker. Of course 'single characteristics' must be distinctive, and then the only danger in the procedure is that one may occasionally be involved with a new species having convergent characteristics. This too is only a danger that from a practical point of view is unimportant.

The work covers much the same ground as Miss Evans's *Guide to the Anopheles of Tropical and South Africa* (1927), but the account of the larval structures is much more complete.

The illustrations are beautiful, and practically make the monograph into a one-point-per-species key.

C. S.

ALESSANDRA MAGNO.—By Mario Bertolotti. Torino: Fratelli Bocca, Editori. Pp. 413, illustrated. Price, 54 lire.

THIS critical discussion on the medical history of Alexander the Great makes most fascinating reading. The sources from which the author has been able to draw his information are innumerable; one gains the impression that the museums of Europe are littered with medallions, busts and statues of Alexander—many of which are apparently contemporary—and that all books which have come down to us from the age of the great Greek and Latin classics are full of descriptions of the man himself, his physical abnormalities and the diseases from which he suffered. This of course is a tribute to the industry and art of the author.

The book is divided into three parts: The first part deals with such matters as his heredity and birth, his physical constitution, his facial and cranial morphological characteristics, and the torticollis which is so apparent in some of his busts. The second part deals with his wounds, the fracture of the base of his skull, and the perforating wound of his chest which led to an empyema. In the last part the author discusses the epidemic diseases (e.g., dysentery) which ravaged his armies and to which he himself fell a victim, his last illness, and his death from a fever at first intermittent and then high and continuous. His temperature chart has been reconstructed from the diary of his physician.

There is usually much speculation in a book of this nature, but in this instance it is reduced to a minimum by the enormous amount of authentic information that is available and that the author has collected.

The book is well printed on good paper and there are about seventy good text figures. It is very reasonably priced at 54 lire.

A CATALOGUE OF THE PUBLICATIONS OF BAILLIÈRE, TINDALL AND COX IN MEDICINE AND SCIENCE, 1932.

We have very much pleasure in bringing this catalogue to the notice of our readers. The four sections deal respectively with (i) medical, dental and nursing; (ii) veterinary, foods, botany and agriculture; (iii) science and miscellaneous; and (iv) periodicals and reports. There is a joint authors' and subjects' index as well as the list of publications in detail by title; this enables any subject or author to be rapidly looked up.

All medical librarians in India should be in possession of a copy, whilst many practitioners and specialists may care to consult it.

Annual Reports

ANNUAL REPORT FOR 1931 OF THE NATIONAL ASSOCIATION FOR SUPPLYING MEDICAL AID BY WOMEN TO THE WOMEN OF INDIA (COUNTESS OF DUFFERIN'S FUND, INCLUDING THE WOMEN'S MEDICAL SERVICE). SIMLA, 1932, GOVT. OF INDIA PRESS.

THIS annual report is in itself so much of a review that it is not easy to review it. It begins with a list of officers and managing bodies of the Fund, followed by the rules and regulations and a memorandum of the Association. Ten meetings of the Executive Committee were held during the year and two meetings of the Council. The Dufferin Fund proper spent its annual income as usual on scholarships to medical students and grants for the maintenance of women's hospitals; 27 scholarships were granted during the year. It is doubtful whether the monthly stipend of Rs. 30 per mensem under these scholarships is sufficient to meet expenses, and at Bombay and Calcutta the amount of two of the scholarships has been raised to Rs. 40 per mensem. During the year in the hospitals under officers of the Women's Medical Service, Senior Branch, 1,521 beds were available for women and children, and in these 35,156 in-patients were treated, including 9,607 maternity cases. No less than 14,269 operations were performed, including 1,106 abdominal sections. A very important feature of the work at these hospitals is that 205 young Indian women were under training as nurses at the close of the year. The course consists of three years in general nursing, and an extra six months for midwifery training. All are now examined under recognised boards of examiners. This state of things would have been impossible ten years ago.

The covering report is next followed by detailed reports from the various hospitals. At the Lady Hardinge Medical College at Delhi there were 137 students in residence, drawn from all over India. Dr. Rekhi was sent to England by the Rockefeller Trust, took her D.M.R.E., and returned to the college as Professor of Radiology. As the college is an all-India institution it has been suggested that the different provinces and Indian States who send students for training should contribute and should have places reserved for them at a rate of Rs. 1,500 per annum per student. The residential accommodation at present available is only for 100 students, and the construction of an additional hostel at a cost of Rs. 1½ lakhs has to be faced. In the attached hospital a beginning has been made of treating cases of inoperable malignant disease on the surgical side with lead selenide, and on the gynaecological side with radium. A standard pharmacopeia for the hospital was prepared and brought into use during the year. The obstetric and gynaecological unit treated 2,116 patients during the year, and opinion is steadily gaining ground that the lower segment Cæsarean section is preferable to the abdominal method. Radium was used in 18 cases of carcinoma of the cervix, and gave very good results in cases of fibrosis uteri, but a deep x-ray therapy set is badly needed as an additional measure for this work. In the surgical unit surgical diathermy was largely resorted to in cases of malignant disease of the mouth, tongue and face; and other cases with metastases gave very good results when treated by intravenous injections of lead selenide. Osteotomy was used for deformities due to rickets and osteomalacia. In the out-patient department a total of 43,334 patients were treated, 30 per cent. of the new cases seen being gynaecological ones. Microscopically proved cases of malaria numbered 315, with the following distribution

<i>P. vivax</i>	..	..	136
<i>P. malariae</i>	..	..	28
<i>P. falciparum</i>	..	..	132
mixed infections	..	..	19

and the peak of fresh infections was in October and November. The number of pupil nurses under training

during the year was 49, whilst there is also a three years' course of training for compounders.

At the Victoria Zenana Hospital, Delhi, there was still much overcrowding in the wards. Owing to financial shortage even the usual annual repairs and whitewashing could not be done, and there was an acute water stringency in the hot weather. At the Lady Reading Hospital, Simla, the year opened with a deficit of over Rs. 8,000, but thanks to fresh donations and subscriptions this was wiped out during the year, improvements have been effected in the operation block, and scholarships endowed for nurses. The Lady Reading Hospital at Peshawar was opened in December, and when complete will have accommodation for 54 beds. At the Dufferin Hospital at Quetta there was a marked falling off in the numbers of patients owing to the opening of special hospitals for wives and children of Indian troops who formerly used to attend the Dufferin Hospital. At the Government Victoria Caste and Gosha Hospital, Madras, there was a tremendous increase in the work, and a satisfactory feature was the great increase in the number of normal labour cases admitted, owing to the work of the new ante-natal clinic. The Victoria Hospital for Women and Children, Vizagapatam, was badly hit by the withdrawal of the annual subsidy by Government of Rs. 3,000 owing to financial stringency. Despite this clinical laboratory work was extended, and training of municipal midwives introduced at the ante-natal clinic. At the Lady Dufferin Hospital, Karachi, overcrowding was extreme; in-patients numbered 2,978 and 1,145 maternity cases were treated with an accommodation of only 28 beds, many patients having been perforce discharged on the seventh day. The surgical work here is very heavy, patients coming from all over Sind, Baluchistan and even further afield. At the Lady Dufferin Hospital, Calcutta, beds have constantly had to be erected in verandahs and overcrowding is severe; treatment of venereal cases has had to be curtailed for want of funds, and the constant stream of tuberculosis cases which cannot be admitted is a constant difficulty.

In the United Provinces the number of women sub-assistant surgeons and midwives employed on work in the rural areas was increased to 58, and midwife-compounders are being trained. To begin with, it is hoped to employ them in 12 new centres. The number of Dufferin scholarships at the Women's Medical School, Agra, was increased from 15 to 19. At the Dufferin and Lady Lyall Hospital, Agra, 29 new students were admitted. The number of midwifery cases in 1931 was 1,060 as compared with less than 600 treated in 1923, and the work has approximately doubled in eight years.

Everywhere throughout the reports of the various hospitals there is the same tale of acute financial stringency and the stoppage or reduction of grants previously received regularly. The year was clearly one of very great difficulty in making ends meet. On the other hand almost all the reports speak of increased ante-natal work and of increased facilities for training medical women.

Various annexures follow which give financial details of the various funds administered. Annexure VII shows that during the year there were 275 lady students studying in the different medical colleges for university degrees, and 491 for the L.M.P. or equivalent qualifications. Annexure XI shows that there were 39 officers in the Women's Medical Service, Senior Branch, with 4 temporary members, and 8 in the training reserve. There were also 6 officers in the Junior Branch. The report closes with what is the most interesting feature of all, a map of India showing (i) the head provincial centres of the Fund, (ii) hospitals staffed by members of the Women's Medical Service, (iii) hospitals staffed by lady medical missionaries, and (iv) all other hospitals staffed by women doctors only. A glance at the map is sufficient to show how very widespread are the institutions for supplying medical aid by women to the women of India.

ANNUAL CLINICAL REPORT OF THE GOVERNMENT HOSPITAL FOR WOMEN AND CHILDREN, EGMORE, MADRAS, FOR THE YEAR 1930. MADRAS, 1932, SUPDT., GOVT. PRESS. PRICE, RS. 4-8.

The chief interest in this report is the appendix in which full details are given for such cases as occurred of tedious, laborious and preterm labour, complex labour, eclampsia, placenta prævia, causes of morbidity, and of post-partum hæmorrhage, cases of ectopic gestation, and of obstetric operations. These supply a wealth of detail for the cases studied, and the report should be consulted in the original by all interested in obstetric work in this country.

The general work of the hospital is reviewed in Colonel Hingston's covering report, which we may here quote:

The year under report covers a period of increased activity in all departments of the hospital and shows a record number of cases admitted and treated since the founding of the hospital. The total number of deliveries in the hospital, including abortions, was 3,311, which is 211 in excess of the previous record of 1927. The ante-natal and gynecological cases have also increased and it is gratifying to note particularly the steady increase in the number of ante-natal cases treated in this hospital.

During the year under report, the Government sanctioned a Civil Surgeon, who is at present in charge of the ante-natal department and, as was forecasted in the report of the previous year, the out-patient department has been re-organized and separate sections for ante-natal cases, children's diseases, venereal diseases, and general diseases, have been opened. The mothercraft department was started in February 1930 and is now in charge of the Sister specially trained for this purpose in England and the department has been doing very useful work, and has become a centre for the dissemination of correct knowledge in the methods of bringing up infants.

I regret that owing to the financial crisis, and the necessity for retrenchment, it has not been possible for the Government to proceed with some of the essential building programmes which were outlined in the previous report. Plans and estimates were drawn up and provisional sanction was also accorded by the Government, but unfortunately the financial crisis having supervened, the building programme has had to be held up. It is my hope that as soon as the financial situation improves, it will be possible for the Government to undertake the construction of the septic pavilion of the hospital, the extension to the delivery ward, the ante-natal and children's block. With the increase in the number of patients, it has been found very difficult to provide suitable accommodation for them, and at present, there has been a good deal of congestion particularly in some months of the year, both in the puerperal wards as well as in the ante-natal and gynecological wards.

There has been steady progress in the activities of the staff of the hospital and frequent clinical meetings have been held, at which papers were discussed and cases exhibited. House surgeons and post-graduates have begun to take a greater amount of interest, and it is gratifying to note that candidates have come forward to take training and sit for the diploma in gynecology and obstetrics which was recently instituted by the University. The first candidate appeared for this examination in April 1931 and passed, and since then, another batch have also appeared. The clinical material available in this large institution has been fully utilized in training the students as well as the House Surgeons and post-graduates from different parts of the country.

As has been indicated above, the very large increase in the number of patients admitted to the different sections of the hospital necessarily imposed a greater amount of work on the medical and nursing staff and I should like to place on record my appreciation of the

very valuable work that they have done and the interest and enthusiasm with which they have whole-heartedly co-operated towards the successful work of the year under report.

In-patients

During the year 1930, 7,934 women and 732 children were treated in this hospital and the following table gives the particulars regarding these admissions:—

	Admissions	Deaths
(1) Ante-natal cases ..	2,122	19
(2) Maternity cases ..	3,311	67
(3) Post-maternity cases ..	220	31
(4) Children's section ..	732	122
(5) Gynecological cases ..	1,233	31
(6) General diseases treated ..	1,043	46
TOTAL ..	8,666	316

Three thousand, three hundred and eleven women were delivered during the year, of whom 252 were cases of abortion.

Out of the total number of deliveries, 1,911 women were delivered naturally, with one death. The death occurred in a multipara, who was delivered before examination of a live female child weighing 7½ lb., and was due to shock after delivery. There were 426 primiparae and 1,486 multiparae. Among the natural deliveries, 24 children were born still. The causes of still-births are given in Statement II (b) and it will be noticed that twelve of these still-births were due to prematurity.

There were 74 cases of tedious labour, with one death, 37 of them being primiparae and 37 multiparae. The death in this instance was due to puerperal septicaemia and *Bacillus gaertneri* was isolated from blood cultures.

There were 226 cases of laborious labour, in 209 of which delivery was effected by the application of forceps. The indications for the application of forceps are given in Statement IV (a). It will be noticed that in 30 of these cases, the position was occipito-posterior, in five cases although a cephalic presentation was found, delivery was effected by internal podalic version and four of these children were born alive. It has been our experience that in those cases where it is necessary to effect delivery on account of the signs of foetal distress and the greatest diameter of the head has not yet passed through the brim of the pelvis, it is safer in the interests of the mother and child to perform internal podalic version and deliver the child, provided there are no contra-indications either on account of any degree of contraction of pelvis, or on account of the condition of the uterus.

There were two cases of symphysiotomy, nine cases of Caesarean section and one case of craniotomy.

There were 120 cases of preterm labour, of whom 38 were primiparae and 82 multiparae.

There were 727 cases of complex labours, which is very much in excess of last year's figures. The details of the complications are shown in Statement VI (a). It will be seen that practically all the tropical diseases common in this country have been met with in association with pregnancy, and their deleterious effect both on the mother and the child will be clear from a perusal of the statement referred to above.

There were 37 cases of twins and two cases of triplets. In one of the latter, delivery was spontaneous, but the children each with a birth weight of about 1 lb., died soon after birth. In the other case, the diagnosis of triplets was made and confirmed with the aid of a skiagram and as the woman was past her time and was feeling considerable inconvenience on account of the weight of the uterine enlargement, labour was induced by the administration of castor-oil and quinine. Delivery was effected by internal podalic version and extraction of each child. The children weighed, respectively, 4 lb. 6 oz., 4 lb. 14 oz., and 4 lb. 8 oz., and were discharged from the hospital alive and healthy, and the mother and children were under the care of the Child Welfare Centre of the Corporation. Excluding the two

cases of triplets, the mode of delivery of the 74 twin children were: forceps 13 cases, breech extraction 6, internal podalic version 3 and spontaneous delivery in 62 others. Of the 80 plural births, 30 were male and 50 female, and only 27 full term. The weights of the children are given below:—

Under 2 lb.	..	..	6
From 2 to 3 lb.	..	..	16
From 3 to 3½ lb.	..	..	7
From 3½ to 4½ lb.	..	..	17
From 4½ to 5 lb.	..	..	7
From 5 to 6 lb.	..	..	24
Over 6 lb.	..	..	3
TOTAL			80

Eclampsia

There were 81 cases of eclampsia treated during the year, of which seven cases died. The particulars with regard to the cases that died are given in the mortality statement. One of these was a case of recurrent eclampsia. The treatment followed in these cases was that outlined in the previous year's report. The other complications in the cases which were confined were accidental hæmorrhage—24 cases with two deaths, placenta prævia—18 cases, rupture of uterus—9 cases with seven deaths, descent of funis—12 cases.

Correspondence

CHANGES IN CARDIAC RHYTHM IN A CASE OF RHEUMATIC MITRAL DISEASE COMPLICATED WITH BRONCHO-PNEUMONIA

To the Editor, THE INDIAN MEDICAL GAZETTE
SIR.—Would you very kindly insert in your next issue a correction to the paper by myself and Mohammad Yusuf in your October issue. The paper was on 'Changes in cardiac rhythm in a case of rheumatic mitral disease complicated with broncho-pneumonia'. The correction is:
Line 37. After '100 to 125 per minute' insert 'with occasional extra-systoles'.
Yours, etc.,
T. A. HUGHES, M.A., M.D., D.P.H., M.R.C.P.,
LIEUTENANT-COLONEL, I.M.S.

MAYO AND A. V. HOSPITALS,
LAHORE,
4th November, 1932.

THE PLACE OF PSYCHIATRY IN THE MEDICAL COLLEGES AND SCHOOLS IN INDIA

To the Editor, THE INDIAN MEDICAL GAZETTE
SIR,—I have read with interest Colonel Berkeley-Hill's article in the October (1932) issue of the *Indian Medical Gazette* entitled 'The Place of Psychiatry in the Medical Colleges and Schools in India'. With reference to his lines advocating the offering of facilities to students of medicine for the study of the actual cases of mental disorder (*vide* p. 583, para 2, lines 49 *et infra*), I beg to draw his attention to the following incident. On the 24th October 1931, I, then a house physician at the Medical College Hospital, Calcutta, visited the mental hospitals at Kanke together with two other friends, both graduates of medicine. We were refused admission to the hospitals, even on pointing out to the junior officers at the gate that we intended to see the patients from a scientific point of view, not as lay sightseers. We begged for guidance from the management specially regarding the classification of patients and the line of treatment adopted. In return we were asked to make a generous contribution to the poor box, or amusement fund, or something like that, to secure our admittance; whereupon we left the place in disgust and disappointment. Unfortunately, neither Colonel

Berkeley-Hill nor Major Dhunjibhoy were available at that time. The instance is recalled to illustrate how at times scientific inquisitiveness is snubbed by the zealous adherence to routine procedure.

Yours, etc.,
S. CHATTERJEE, M.Sc., M.B. (Cal.).
46, KAILASH BOSE STREET,
CALCUTTA,
19th October, 1932.

[Note.—We sympathize with Dr. Chatterjee for the cold reception he encountered at the Kanke mental hospitals; it is very discouraging to have one's entirely laudable enthusiasm damped, but there is another side from which the incident must be viewed. There are few, if any, well-run institutions where strangers, even medically qualified strangers, are allowed to wander unattended at all hours of the day, and it is often inconvenient to depute members of the staff to conduct such visitors round an institution. Medical men who wish to visit any institution would be well advised to write in to the officer in charge, stating who they are, and in what particular subject they are interested; this allows the officer in question to appoint a suitable time for their visit and to arrange for them to be conducted by someone in a position to give them the information they require.

We do not think that Colonel Berkeley-Hill was advocating these casual visits to mental hospitals to learn 'all about mental diseases' in a couple of hours, but rather was deploring the lack of systematic training in psychiatry which made them necessary. Nevertheless, we feel quite convinced that had Dr. Chatterjee and his friends written to Colonel Berkeley-Hill officially they would have had a very different reception. We have sent a copy of Dr. Chatterjee's letter to the Officiating Superintendent of the European Mental Hospital at Ranchi who has replied that it has always been Colonel Berkeley-Hill's policy to place no obstacle in the way of anyone who wishes to visit the hospital, and that even in Colonel Berkeley-Hill's absence this policy has been persued.—Editor, I. M. G.]

THE ROSS INSTITUTE

To the Editor, THE INDIAN MEDICAL GAZETTE
SIR,—In 1923 a movement was started to found an Institute to perpetuate for all time the name of Sir Ronald Ross, to carry on research work, and to stimulate malaria control measures in the Empire. The Ross Institute was officially opened in 1926 by H. R. H. The Prince of Wales, and Sir Ronald Ross was the Director-in-Chief until his death. What the Institute has already achieved is well known the world over, but if its work is to be continued more financial support must be forthcoming immediately. There is no endowment fund and for two years contributions have been 25 per cent. below expenditure. This state of things cannot go on much longer. Surely an effort can be made to save the Institute and place it on a sound financial basis.

Yours, etc.,
C. C. McLEOD,
Chairman,
COMMISSIONER, BOMBAY.

POTNEY HEATH,
LONDON, S.W. 15.
11th October, 1932.

Service Notes

APPOINTMENTS AND TRANSFERS
LIEUTENANT-COLONEL W. L. HARNETT, on return from leave, is re-appointed as Professor of Surgery, Medical College, and Surgeon to the Medical College Hospitals, Calcutta, with effect from the 10th September, 1932.

Lieutenant-Colonel K. S. Thakur, officiating Civil Surgeon, 24-Parganas, on relief by Lieutenant-Colonel Denham White, is posted as Civil Surgeon, Howrah.

Lieutenant-Colonel J. D. Sandes, on return from leave is re-appointed as Professor of Medicine, Medical College, Calcutta, and First Physician to the College Hospitals, with effect from the 5th October, 1932.

Lieutenant-Colonel C. H. Smith, M.B., an Agency Surgeon, on return from leave, is posted as Legation Surgeon, Nepal, and *ex-officio* Assistant to the British Envoy of Nepal, with effect from the afternoon of the 30th September, 1932.

The services of Major I. S. Nalwa are placed permanently at the disposal of the Government of Burma for employment in the Burma Jails Department, with effect from the 10th August, 1930

LEAVE

Lieutenant-Colonel E. H. V. Hodge, Civil Surgeon, Howrah, on relief by Lieutenant-Colonel K. S. Thakur, is granted leave for 6 months, with effect from the 26th November, 1932, or date of availing.

Lieutenant-Colonel R. Knowles, Professor of Protozoology, School of Tropical Medicine, Calcutta, is allowed leave for 5 months and 25 days, with effect from the 27th July, 1932.

Lieutenant-Colonel M. S. Irani has been granted leave on average pay in India for 6 months, with effect from 9th September, 1932.

In modification of Government Notification, Lieutenant-Colonel R. F. Steel, Civil Surgeon and Superintendent, B. J. Medical School, Poona, is granted leave, with effect from the forenoon of 19th February, 1932, up to and inclusive of 27th April, 1933, pending retirement.

Major A. J. D'Souza, M.C., late Senior Medical Officer, Port Blair, is granted 8 months' leave on average pay and in continuation study leave for 6 months and 25 days, combined with leave on half average pay for 3 months and 5 days, with effect from the 26th May, 1932.

PROMOTIONS

Captain to be Major (provl.)

B. R. Tandon. Dated 25th August, 1932.

Lieutenant (on prob.) to be Captain (provl.) (on prob.)

M. G. Saincher. Dated 12th October, 1932.

The seniority of Lieutenant G. Milne is ante-dated to 4th February, 1928.

RETIREMENTS

Colonel L. P. Brassey retires on account of ill-health, September, 1932.

Notes

SCLERAL MARKER:

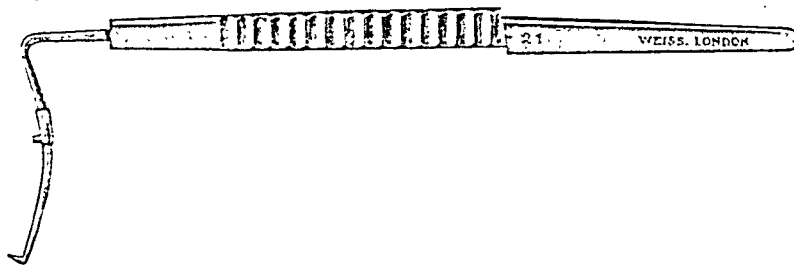
AN ACCESSORY TO THE IGNO-PUNCTURE TREATMENT OF DETACHED RETINA

DR. STEWART MACKY, D.O.M.S., Western Ophthalmic Hospital, London, N.W., writes: To overcome the difficulty, in some cases, of marking out the position for the scleral puncture when using the ordinary callipers, Amsler advised his set of eleven 'markers'. Simple and effective as these are in most cases, there still remain

it difficult to avoid rucking the conjunctiva over the line

Thanks are due to Mr. J. Cole Marshall for his suggestions and for allowing me to try out various modifications in his clinic at the Western Ophthalmic Hospital.

Any use of this instrument is the accurate definition of the equator in following Jameson's technique for fixation of the recti muscles in cases of squint.



a few instances in which the accurate measuring of the distance is a difficult procedure.

The fault we find with Amsler's markers is that they are too straight. We have overcome this by simply bending the shaft nearly at right angles, and find the marker now 'sits snugly' in any position of the eye.

Another addition or improvement is that, by using a sliding collar and marking the shaft in millimetres, we have been able to reduce the number of markers to two (10 to 15 mm. and 16 to 21 mm.). The collar also carries a blunt stud, which can safely be rested over the limbus when 'stepping out' the distance. We find this the greatest improvement. Even if (as sometimes unavoidably happens during retraction of the wound) the conjunctiva is drawn up over the limbus, this little stud can be slipped under the fold, with a rotating movement, and a very accurate measurement made. This can be done in most instances where the callipers can be used of course, but the sharp point always seems to me rather dangerous. The simple notch cut on the original Amsler marker needs the most careful adjustment to ensure accuracy, especially in those cases where

Messrs. Weiss & Son, Ltd., have made this instrument and can now supply it.

NOTES IN DERMATOLOGY

A VERY extensive review of recent advances in dermatology appears in the current (October) issue of *The Prescriber*. The review, which covers twenty-seven pages of the journal, and has a bibliography comprising 109 references, describes all advances in this subject for the past few months. Among outstanding items may be mentioned the relation of hyperglycæmia to skin disease, the existence of a pathologic glycaemia curve being characteristic of certain dermatoses which are accompanied by disturbance of the carbohydrate metabolism, the discovery of a connection between allergic conditions and to have certain therapeutic indications, has been shown to be non-specific in character and to be present in all urines but more so in the urine of sick persons. A possible relationship between the thyroid body and alopecia areata is suggested, the evidence so far

adduced is not sufficient to warrant a claim of specificity for pituitary extract in this condition. A large number of substances have been shown to be responsible for dermatitis, one of the latest reports showing a case of contact dermatitis in an anaesthetist through handling avertin. A large portion of the review deals with fungus infections, some of the latest developments, such as the trichophyton test, being described. The review is very complete and gives an admirable summary of recent developments in this important subject.

IODISED 'MOOGROL'

Iodised 'Moogrol' for the treatment of leprosy is now issued by Burroughs Wellcome & Co., Snow Hill Buildings, London, E.C. 1.

It is a mixture of esters of the acids of the chaulmoogric series combined with 0.5 per cent. of iodine. The addition of the iodine markedly reduces the irritating properties of the ethyl esters. Preliminary clinical experience confirms that iodised 'Moogrol' is less irritating than plain 'Moogrol'.

At the Leonard Wood Memorial Conference of Leprosy, held at Manila in January, 1931, the use of iodised esters, particularly by the intradermal method was strongly recommended. The intradermal or intracutaneous method has been employed by the Philippine workers for some years and the advantages claimed are that it produces a more rapid resolution of superficial lesions and that it is relatively free from general and local reactions.

Iodised 'Moogrol' is issued in bottles of 25 c.c. and 100 c.c. and 1 litre.

CONCENTRATED LIQUID LIVER EXTRACT (B. W. & CO.)

BURROUGHS WELLCOME AND COMPANY, Snow Hill Buildings, London, E.C. 1, have issued Concentrated Liquid Liver Extract (B. W. & Co.) which may supplement, or replace the whole of, the amount of fresh liver in a daily diet. It is a palatable product and can be taken over long periods. Concentrated Liquid Liver Extract (B. W. & Co.) is issued in bottles of 4 1/2 fluid ounces, one fluid ounce containing the equivalent of 8 ounces of liver.

ANTIPHLOGISTINE IN TINEA INTERDIGITALIS

TINEA interdigitalis, known commonly under names such as ringworm, athlete's foot, gymnasium itch, Shanghai foot, etc., and caused by the fungus *Trichophyton interdigitalis*, is one of the most widespread of fungus diseases. Embedding its spores into the skin and multiplying readily, it affects not only the feet but frequently the hands.

The application of Antiphlogistine dressings, which contain a high percentage of glycerine, together with the exerting penetrating action of the synergetic action of the ingredients, will be found very effective in allaying the irritation, itching and discomfort, and is a most valuable agent in combatting this condition.

'COLLOSOL' HALIBUT LIVER OIL

THE importance of vitamine A—the anti-xerophthalmic factor—is now well known. In 1931 Green, Davis and Mellanby published results of observations made on 550 pregnant women of the ante-natal clinics of Sheffield and Manchester delivered in hospital. Of these half were supplied with vitamines A and D during pregnancy, the others serving as controls. In the treated cases only 1.1 per cent. developed xerophthalmia, as compared with 11 per cent. in the control group. Further, Lasser has shown that diminished resistance to infection is especially associated with deficiency of vitamine A.

The usual medicinal source of supplementary vitamine A is from cod-liver oil, but recent work has shown that the oil from the halibut is much richer

in 'Collosol' brand halibut liver oil is extracted by a special process which does not involve the use of any solvent. It is claimed that its vitamine A content is fifty times that of cod-liver oil, a dose of two to three drops being equivalent to a teaspoonful of the finest cod-liver oil. The 'Collosol' product is standardised to contain not less than 2,000 vitamine D international units per gramme, and spectroscopically to contain 1.85 per cent. of vitamine A. The preparation is put up in 5 c.c. phials at Rs. 3-6 per phial, and the Indian agents are The Crookes Laboratories, P. O. Box 500, 10, Graham Road, Ballard Estate, Bombay.

WATSON'S MICROSCOPE RECORD.

THIS most useful little publication should be known to all microscopists, for it is full of information and 'tips' of practical importance. In a recent number, no. 26, E. Gardner Williams has an interesting article on fossil plants and their microscopic study; there is a useful article on the stability of mounting media by the late Chapman Jones; M. G. Orr gives instructions for using Whatman's 'diffusion shells' for dehydration; by this method the object to be dehydrated is placed in a small quantity of 20 per cent. alcohol in the bottom of a diffusion shell, and the latter is then inserted in a wide-mouthed bottle half filled with absolute alcohol in such a manner that the open end of the shell projects well above the surface of the spirit. Within 48 hours the material will be found lying in practically pure alcohol within the shell and can be transferred at once to absolute alcohol. The Rev. Dingley P. Fuge deals with diatoms of genus *Triceratium*, E. R. Newmarch with fresh water polyzoa, and there are notes on many subjects of interest to microscopists.

Messrs. W. Watson & Sons, Ltd., 313, High Holborn, London, W.C. 1, will be glad to supply the *Microscope Record* free to those who are interested.

Publishers' Notice

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles are entitled to receive 25 reprints *gratis*; additional reprints can be obtained on payment. No reprints will be supplied unless contributors ask for them at the time of submitting their manuscripts.

Communications on Editorial Matters, Articles, Letters and Books for Review should be addressed to THE EDITOR, *The Indian Medical Gazette*, c/o The Calcutta School of Tropical Medicine, Central Avenue, Calcutta.

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